THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

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NOTICES.

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All Communications to be addressed to the Editor, No. 42, Parliament Street, Westminster; and orders for Advertisements to the Publisher, Mr. W. B. King, No. 11, Bolt Court, Fleet Street.

TO CORRESPONDENTS.

H. B.—*A "nuisance" is described in the Nuisances Removal Act to include*—1, *any premises in such a state as to be a nuisance or injurious to health*; 2, *any pool, ditch, gutter, water course, privy, urinal, cesspool, drain, or ashpit so foul as to be a nuisance or injurious to health*; 3, *any animal so kept as to be a nuisance or injurious to health*; *and* 4, *any accumulation or deposit which is a nuisance or injurious to health. At common law a nuisance may be described as any thing which interferes with the peace and comfort of a neighbour or of the public in the enjoyment of their legal rights. The unlawful ringing of bells, or unlawfully interfering with the public highway, or annoyance and damage by smoke, or soot, or by bad odours, are all held to be nuisances, and gas companies ought ever to keep in view the judgment in the case of* Broadbent v. the Imperial Gas Company *which has been confirmed by the House of Lords.*

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 31, 1860.

NOTES UPON PASSING EVENTS.

PARLIAMENT has met, and the business of the Session seems to have opened in a serious manner, although so few hours have elapsed since the flourishes of trumpets were heard. We have already had the advantage of hearing Mr. Slaney's notice of motion for the encouragement of the execution of supposed improvements, by so-called voluntary impositions. Sir G. C. Lewis has presented his favourite measure for bringing the highways of the country under the control of the Central Government; and he has also condescended to allow the dicussion of the important question of appeals in criminal cases. The motion by Mr. Elphinstone, with respect to the appointment of a public functionary specially charged with the verification and proving of chain cables, might be made the groundwork of a general measure for the control of the very immoral and impolitic practices of our Iron masters in far too many of the details of the manufacture; and, under any circumstances, the inquiry into the special question Mr. Elphinstone has selected must become useful to the community. Mr. E. James has been eloquent about the shrubs in Hyde Park; and the note of preparation has been uttered by the Metropolitan Board of Works. Will any good come after all? Alas! we fear not; for there seems to be no more desire on the part of the Members of the Legislature to discharge conscientiously their duties as Representative Men than there was wont to be; and the public is as apathetic as it has long been about the proceedings of its self-constituted guides. Be this as it may, the discussion in Parliament of the numerous questions connected with public Health must eventually draw attention to the principles they involve; and therefore it is that we think that even Mr. Slaney's Utopian doctrines must, in the end, work out for good.

As to the necessity for some kind of control over the processes of manufacture by our Iron masters, we believe that few men will differ from us when we distinctly state that we consider some such course absolutely necessary; and therefore it is that we return to the subject. Twenty years since, the common wrought iron, brought into the London market, was of a quality which would admit of its being punched, or drawn, or welded; but at the present day—whether it be on account of the mania for cheap production, or of the use of the processes for applying the hot blast, or for converting the cinder—the ordinary commercial bar iron of Wales and Staffordshire is barely superior to cast iron, and it is utterly unworthy of the name of malleable iron; in fact, it is almost impossible to punch or to weld it. To our minds, there cannot be any doubt as to the cause of the sad accident of the *Royal Charter;* and, as we are convinced that the unfortunate vessel in question was wrecked in consequence of the bad material used in making its chain cables, and that it subsequently went to pieces on account of the bad iron used in the hull, we hold the parties who used, or knowingly supplied, such bad iron to be morally responsible for the loss of so many of their fellow-creatures. The iron masters themselves are the parties who would gain the most by the establishment of some effectual check to the sale of bad iron; and sure we are that they would do wisely in supporting, or in extending, the scope of Mr. Elphinstone's measure (provided that it be not made an instrument for the development of functioneering), with a view to restoring confidence in the value of the goods they manufacture. Gas and Water Companies are, we would add, equally interested with the iron masters in bringing about some radical improvement in this branch of industry; for much of the leakage of gas, and many of the accidents from bursting of water-mains, are to be attributed to the constantly deteriorating quality of the pipes made from first runnings. To such an extent is this the case that we are almost disposed to assert broadly, that no gas or water engineer would hereafter discharge his duty to his employers, if he allowed the use of pipes cast in a factory where there is a smelting furnace, or which are not made, *under his own inspection*, from second runnings.

There will no doubt shortly come under the revision of the Legislature the all important question of the Poor Laws; for, if we mistake not, the present organization of the Poor Law Board will expire in the course of this Session. Gas and Water Companies are directly interested in this matter, from the enormous amount of their contributions to the poor-rates, even if the members of such companies had no personal concern in the welfare of their poorer brethren. We urge the legal advisers of those bodies, therefore, to watch carefully the proceedings of the Central Administration with respect to this subject, and, if possible, to force from it some intelligible method of assessing the rates on the property of their clients.

There is one detail of universal importance connected with the present system of poor laws, to which incidentally we here allude. It is the Act by which, after a five years' residence in any place, the parochial authorities, to whom a pauper may apply for relief, are prohibited from removing him to his own parish. There were, perhaps, hardships in the old law on this subject; for undoubtedly it was unfair that a man should spend the best days of his life in one locality far removed from his birthplace, and be cast as a burthen in his old age upon the latter; but the present law, by encouraging the tendency of proprietors of close parishes to pull down labourers' cottages, and to drive their inhabitants into the neighbouring towns, is producing so fearful a demoralization of the labouring classes of our agricultural districts as, we think, far to outweigh the minor evil we have above referred to.

The last few weeks have witnessed some events interesting to the members of the Engineering and Architectural professions, of sufficient importance to our Readers to justify, we

believe, a reference to them on the present occasion. One of these events was the resolution of the members of the Royal Institute of British Architects to dispense hereafter with the patronage of live lords, and to elect periodically their President from amongst the members of their own body, This was as it should be; and most earnestly do we congratulate the Institute on its having at last thrown off the tendency to "snobbishness" of which previously it was exposed to be accused. To be great Artists, men must learn to be independent even of Macænases. Another event is the result of the Artesian boring at Ostende, where, after passing through the tertiaries, and the ordinary upper secondary formations, the tools passed suddenly into the schists and slate rocks, in precisely the same manner as at Calais and at Harwich. A third subject for remark is the opening address of Mr. Bidder at the Institution of Civil Engineers, on the 10th instant; for, even when exposed to challenge, this address is so fearlessly bold, and so truthful, that it commands respect, and compels even a casual reader to think. Mr. Bidder states that much of the mischief lately caused by the promulgation of the absurd nonsense of the late Board of Health upon Hydraulic Science, ought to be attributed to the carelessness and indifference—not to say the moral cowardice—of the members of the Institution; and, indeed, it *was* the duty of that body to have decidedly protested against any such official perversion of public opinion. Yet, with the exceptions of Mr. Hawksley, Mr. C. May, and Mr. Neville, who have from the beginning consistently attacked the false doctrines of the mischievous rulers of the late Board of Health, no eminent members of the Institution of Civil Engineers have entered the lists with them; and the public has only been undeceived, as to the merits of its blind guides, by the bitter lessons it has received from the failure of all the works executed in accordance with the advice of the Chadwickian professors of Hydraulics. We beg, however, to take exception to one part of Mr. Bidder's address, namely, that in which he says that "it is a delusion to suppose that the sewerage of towns would necessarily be of a highly fertilizing character;" because the words used do not convey the real facts of the case, nor (we suspect) the real meaning of the author. If Mr. Bidder meant to say that the value of the fertilizing matters in the sewerage of towns was so small as not to warrant the cost of extraction by any of the known methods, he was quite correct; and both Mr. Mechi and Liebig are at present doing mischief by diffusing exaggerated opinions on this subject. But there must certainly be materials of a fertilizing character in town sewerage, and the problem to be solved by engineers, or chemists, is how to apply them to the land economically. As we have said before, we are convinced that the only mode of effecting this object is by a system of irrigation; but the practical difficulties which lie in the way of so doing are to be found in these considerations, viz., that it is not easy to find within accessible distances a sufficient area of suitable land to receive the sewerage; and that, when found, the level of such lands may be unfavourable.

Mr. Bidder has done good service to the cause of Private Enterprise in another matter, which has a far wider bearing than would be suspected from the very special nature of the circumstances which induced him to come before the public. It appears that Mr. Bidder is Chairman of one of the associated lines of the Eastern Counties Railway, and that, like all the unfortunate travellers on that most infamously mismanaged group, he is strongly impressed with the conviction that the interests of the shareholders are suffering from the bad policy of its present Direction. Somehow, it would appear that, with the glorious exception of the Brighton Railway Board, a mysterious law of nature exists by which every man (however intelligent in private life) becomes, as it were, smitten with mental blindness when he enters upon the direction of a large Company, or upon any branch of public Administration. How otherwise can we account for the obstinacy with which Railway Directors persist in ignoring the law "that three sixpences are better than a shilling," especially when it costs no more to earn the former than it does to earn the latter? *Mutato nomine* this remark will apply to many Gas and Water Companies; and therefore it is to be hoped that their Directors will benefit by the lessons of political economy conveyed in Mr. Bidder's letter to the Eastern Counties Board, and in the last Report of the Brighton Railway.

The Registrar-General could not, of course, allow the opportunity furnished him by the influence of the late heavy rains on the quality of the water supply from the Thames to justify an attack upon the London Water Companies, to escape his notice. Of course, after so long a series of heavy rains, the affluents of the Thames, which flow upon clay or gravel, have arrived at the works of the various companies in a foul state, from the amount of suspended matter washed down from the uplands. No mechanical filtration, on a large scale, can remove some of these impurities; and, at all times, we believe that a second, or house-filtration, is required to remove the fine suspended clay of the water derived from the Thames. In saying that such second filtration was required, the Registrar-General was, then, simply uttering a self-evident truth; but he was not justified in inferring that there was anything blameable in the impurity of the London Waters as now supplied. It would be worth the while of the London Companies, we would add, to publish weekly analyses of their waters as compared with the variations in the qualities of the so-called pure sources, in order to counteract the mischievous effects of these interested attacks upon their property.

Perhaps it may interest the Directors of those Companies to hear that, whether from their demands, or their exclusiveness, the Well-sinkers' trade in London is at the present day more active than it has been for many years past. We ourselves anticipate that much disappointment will ensue in these matters; for the subterranean basin of the Metropolis has been so long and so plentifully drained, that we fear an increase in the demand upon it will not be supplied.

In the Law Courts some very important cases have lately been tried, to which the attention of Gas and Water Companies especially should be directed. The first of these cases is the very important one of the *New River Company v. Johnson* (of which a full report will be found in the subsequent part of our JOURNAL); and on this occasion the Court of Queen's Bench extended the principles of the decisions in the cases of *Acton v. Blundell* and of *Chasemore v. Richards*, so far as to relieve the New River Company from an evident statutory obligation. We do not hesitate to say that the law which is now received on the subject of underground waters is essentially bad, and that it is founded upon principles which are in opposition to modern science and to abstract justice. It was assumed, in the first instance, that it was impossible to define the conditions of the flow of such underground waters; but again and again do we assert that this is not true, and that any Engineer, who understood his profession, would be competent to trace the laws under which those waters flow, however the Bench might be disposed to ignore the progress of geological investigation in these matters. The error thus made pervades the whole body of our jurisprudence on the subject; for, since Chief-Justice Tyndall laid down this principle, it has been always held that it is a *damnum absque injuria* to intercept the waters flowing into an underground well or stream. Really it is monstrous that a landed proprietor should be entitled to prevent a neighbour from taking a light over his property, and yet that he should not be able to preserve the supply to a well which has existed perhaps from time immemorial, in his, or his predecessors, enjoyment. The New River Company have perhaps carried their point in this particular case; but they may depend upon it that they themselves have a great interest in procuring a more satisfactory state of the law.

As the case of *Hipkins v. the Birmingham and Stafford Gas Company* is noticed in another part of this JOURNAL, we merely refer to it in passing, in case any of our readers might overlook it; because the ruling of the Chief Baron on this occasion appears to us to exhibit very clearly the spirit of the Bench, whenever Public Companies are unfortunate enough to appear in Court. In the case of the *Queen v. East London Water-Works Company*, however, Chief Justice Cockburn gave a decision of extraordinary justice towards one of those unpopular bodies; and he decided very reasonably that, as the East London Company had been exempted from the lighting-rate, with respect to their mains and pipes, previously to the passing of the Metropolis Management Act, so they were still exempt from that impost, notwithstanding the wording of the 161st clause of that Act. Under any circumstances, we confess that we do not see the justice of making the water-pipes liable to lighting-rates, and, after all, the public may be sure that, by thus burthening the Water Companies, they are only "*pro tanto*" increasing the prices of water to themselves; but it is in vain, apparently, to endeavour to teach political economy to parochial authorities: all they desire is to collect the greatest amount of money with the least amount of trouble. The case of the *Queen v. the Glamorganshire Canal Navigation* seems to

have been somewhat of the same nature as the one last mentioned—viz., an attempt was made to extort an increased rate—and, from the magisterial decision, an appeal has been laid to the Court of Queen's Bench. The arguments and decision have not yet reached us in a form to justify any decided remarks on the subject; nevertheless, the constant recurrence of actions of this description proves the unsatisfactory state of the law with respect to rating, and also the necessity for some collective movement on the part of Public Companies to secure its revision. The various London Companies, as we have said before, are especially interested in this matter.

What can be the motive of the "*Times*" in misrepresenting, as it so constantly does, all the proceedings of the Metropolitan Board of Works, and in repeating in so spiteful a manner every calumny against that unfortunate body? It is true that the Board might have done better than it has done; but the fault, after all, lies mainly with the electors, who could return the "marplots" who figure in an assembly which ought to have been the type of the Metropolitan business habits. But, even though Mr. Leslie may be a persevering bore, and Mr. Hughes may have strange crotchets, there can be no reason for the manifest passion with which the "*Times*" welcomes every chance, fair or foul, of abusing the Metropolitan Board, and with which it reports falsely the proceedings of the meetings of that body. The purity of the *Times* is sufficiently known to render it impossible to suppose that any intrigue of its managers has been traversed by the Board, or that any of its *protegés* has been disappointed in his hopes of a job; so we are compelled to believe that this part of the leading journal has been abandoned to some subaltern writer, who knows nothing about his business. Indeed, the remarks the *Times* reprinted from the *Observer* ("*Arcades ambo*"), prove that our supposition is correct. The only thing that surprises us in the matter is, that Mr. Tite should have taken the trouble to notice the nonsense of those journals.

The good people of Southwark, we observe, have lately been very active in their attacks upon the Gas and Water Companies of their part of the town. They were fortunately beaten in a signal manner in their spiteful proceedings before Mr. Coombe; but, not content with this defeat, they seem disposed now to begin a crusade against the Southwark Water Company for the establishment of the constant supply system. An elaborate report has been issued by Mr. Quick, with a view to allay this excitement; and in it he very ably points out some of the evil consequences of that fatal cause of waste and ruin. This subject is far too important to allow of its being treated incidentally, or at the end of our usual Review; and therefore we must reserve it for the present, especially as it must come before us again very shortly.

Circular to Gas Companies.

The appearance of the prospectus of "The Universal Lime-Light Company" has excited a considerable amount of curiosity amongst all persons interested in gas-works, and this feeling has been materially increased by seeing such a project brought forward under auspices as respectable and influential as those of Mr. Page, the eminent engineer, and of Messrs. Baxter, Rose, and Norton, the well-known solicitors and parliamentary agents. We cannot, however, peruse the documents issued by the company without detecting a certain, and, indeed, somewhat considerable, amount of exaggeration, and conclusions which are not warranted by the facts set forth—of which the assertion that "this improved lime-light can be supplied to the public at one-half the cost of common gaslight" is one example. Our readers will expect from us the fullest information on the details of the *modus operandi* by which results such as those claimed for this system of illumination are proposed to be obtained, and we therefore reprint, in another column, the report of Mr. A. H. Renton, the company's acting engineer, as it contains an able and lucid exposition of the invention, and of the progressive steps by which it has advanced, since its first introduction by Lieutenant Drummond in 1826, to its present state of perfection.

Assuming Mr. Renton's data as to the cost of manufacturing oxygen and hydrogen to be correct, and that his photometrical observations are unimpeachable (both of which conditions are, we apprehend, questionable), he comes to the conclusion that, where a single light of 758 or 1167 wax-candle power is required, the same can be obtained by the agency of the oxy-hydrogen lime-light at half the cost of an equal light from coal gas, when consumed in burners of from 7 to 20-candle illuminating power. In making such a comparison, Mr. Renton has fallen into the same error as Mr. Miller, of Glasgow, to which we had recently occasion to advert, and apparently ignores the fact that the illuminating power of coal gas increases in a much greater ratio than in that of the quantity consumed; and, to render the comparison perfect, single gas-burners should have been used giving lights equal to the lime-light. Besides, the experiments he cites upon the latter are all with burners from 90 to 1200 times greater in illuminating power than the gas-burners with which they are compared, and we apprehend he would find that Westminster Hall will be better lighted with 600 gas lights, properly distributed, than with a single 1200 gas light power lime-light; or Westminster Bridge with 350 gas lights than with one 700 gas light power lime-light; and, if so, the economy claimed for the latter disappears. Candles possess, in one respect, considerable advantages over gas from their portability and their capability of being distributed where the light is most required; and on the same ground gas lights of 10 or 12 candle power are much to be preferred to single fixed lights of from 1000 to 15,000 candle power, such as the lime-lights are represented to be. There are doubtless uses for which powerful lights are required, and for such the lime-light is eminently adapted, but for domestic use, or even for street lighting, we apprehend its value has been much exaggerated.

The company is stated to have purchased the patents of Mr. A. H. J. Bastable and Mr. W. Prosser for improvements upon Lieutenant Drummond's mode of burning a jet of oxygen and hydrogen upon lime. The first of these gentlemen applied for a patent on July 15, 1858, and the latter on April 18, 1859; but neither of these applications was proceeded with, and the patents therefore were never perfected. Abstracts of the provisional specifications were given at pages 61 and 575 of Vol. IX. of this Journal. Mr. Bastable perfected a patent for which he applied on Sept. 14, 1858, the specification of which will be found at page 184 of the same volume; and Mr. Prosser applied on Oct. 13, 1859, for a patent, the specification of which is not yet due. These are, we presume, the two patents which the company have purchased for £16,000 in cash, and £44,000 in paid-up shares, to be issued in the manner stated in the advertised prospectus. Of Mr. Prosser's improvements we can give no other details than are to be found in his provisional specification of April 18, 1859; but of Mr. Bastable's, we extract from his specification the following details, in which he says:—

"This invention consists of improvements in that description of apparatus employed in the production of light in which jets of ignited gas (ordinarily a mixture of oxygen and hydrogen) are projected against a surface of lime or other suitable material, to which a slow motion is given.

"In apparatus constructed according to this invention, I enclose a column of lime or other suitable material in a case or guard, along which the column of lime or other suitable material may be impelled, the case or guard extending above as well as below the opening or place at which the jet or jets of flame strike the lime or other suitable material. At this opening in the case I fix or place wires in such manner that the lime or other suitable material upon which the flame or flames may happen to be impinging shall not fall down or out of the case when it happens to crack or decrepitate by the action of the flame. By these means I am enabled to prevent much of the irregularity in the light which would be occasioned by the breaking away or decrepitating of the lime or other suitable material by the action of the flame, and which may (if not prevented) take place to such an extent as to deprive the jets of flame of the surface of lime or other suitable material upon which they are intended to strike, or remove such surface to too great a distance, so that light of the required volume and intensity will not be produced. The supporting wires may be made of platinum or other material not liable to be injured by the heat, and I place them in such positions that they shall not impede the motion of the column of lime or suitable material, and shall not obstruct the jets of flame; I prefer that the gases for each jet should be regulated by two cocks, one for each kind of gas; by these means, the regulation of the several jets of flame is made independent of each other, and capable of separate adjustment,

"The column of lime or other suitable material may be moved as heretofore by means of clockwork, or any other suitable means. When several gas jets are employed, I prefer to make the column of lime, or other suitable material, of a polygonal form, or to use two or more pieces of lime, or other suitable material, arranged polygonally, so as to present a proper surface or angle for each jet of gas or flame to impinge upon the number of surfaces and angles, depending upon the number of jets used. As, for example, with three jets uniformly disposed around a centre, the column of lime, or other suitable material is made triangular in section, the angles of which may be rounded off or truncated, and the jets being directed to strike on the rounded or truncated angles. By this arrangement, a blending of the light produced by the different jets is obtained, whereas, if a cylindrical piece of lime or other material be employed, the light is thrown more strongly in some directions than in others. Nevertheless, in cases where a considerable number of jets shall be used, so that the space between any two of them is not greater than the width of the flame, a cylindrical column or piece of lime, or other material, may be employed.

"And in order that my said invention may be most fully understood and readily carried into effect, I will proceed to describe the drawing hereunto annexed.

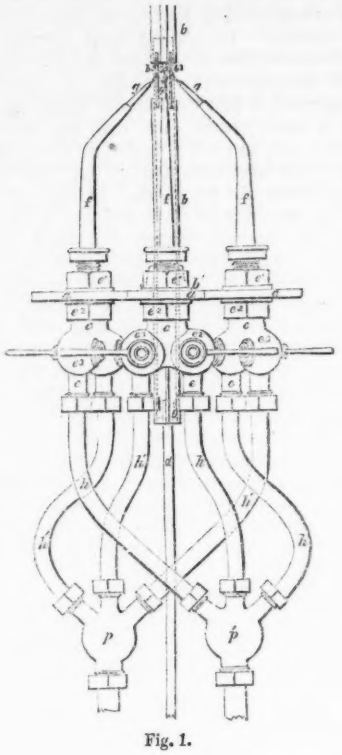

Fig. 1.

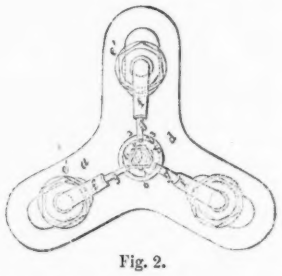

Fig. 2.

Figure 1 is a side view of part of an apparatus to be employed in the production of light, and which is arranged according to this invention; Figure 2 is a plan of the same, with the parts above the line 1, 1, Figure 1, removed. The apparatus shown, is intended for three equidistant jets: *a* is the table of the apparatus, having a circular hole through it at the centre, and three holes arranged round the central hole, and at equal distances from it and from each other. They may, if desirable, be slotted for the adjustment of the jets. In the central hole the case or guard *b* for the lime or other material is fixed; it is a tube of copper or other material made to the form of the pieces of lime or other material to be used with it, and having the collar b^1 fixed on it, the projecting flange of which rests on the upper surface of the table, whilst its lower end passes through the hole, and receives a nut b^2, by which it is secured. The case or guard *b* it will be seen is made in two parts one below and the other above the points where the jets strike, and the two parts of the case or guard are connected by wires or strips b^3 of platinum or other material capable of sustaining the heat, but this complete division of the case or guard is only rendered necessary when the lamp is required to illuminate the space all round the lamp. When the lamp is required to illuminate only a portion of the surrounding space, or in one direction only, the case or guard instead of being in two parts may be in one piece, a portion of it being cut away in the side next the jets to expose the lime or other material to the action of the flame, the lime being protected or guarded by wires or strips of platinum or other suitable metal between the jets of flame, and being of suitable form, as a flat segment of a circle the lime or other material within the case or guard, is formed into a piece or pieces of suitable shape and convenient length, and rests at the bottom on a rod *d*, which is caused to rise gradually at a slow and regular speed by clockwork, or when mercury is employed to raise the lime or other material, then the case or guard is bent up into a **U** form at its lower end, or a separate **U** formed tube may be attached to it, and the mercury being allowed to run from a reservoir in a stream regulated by a stop-cock into one leg of this **U** formed tube, causes the lime or other material, in the other leg to rise, floating on the surface of the mercury; I prefer that the lime or other material should rise at a speed of about an inch and a half in an hour. The upper end of the case or guard should be continued up to a sufficient height to contain the lime or other material which rises while the lamp is in use, or else a bowl or other receptable may be placed at the top or back of the case or guard to receive the lime or other material as it rises above it.

The upper portion of the case or guard being slit lengthwise to admit of the free passage of the lime or other material in its expanded or decrepitated state when it has passed the flame, or a flat spring may be attached to the back of the case or guard so as to press the lime or other suitable material against the front of the tube, and thus to preserve the distance between the jet or jets, and the surface of the lime. In cases where a supply of lime is required for a lengthened period, the lime or other suitable material may be attached to the surface of a cylinder having a spiral groove cut on its surface to receive it, and to which the lime may be securely fastened by any convenient mode. This cylinder, so charged with lime or other suitable material, is made to revolve on its axis, at the same time that its axis receives a progressive movement in the direction of the length of the cylinder; by these means a supply may be provided for many days consumption. For the supply of the gases *e*, *e*, are branch pieces, the upper ends of which are screwed and project up through the holes in the table *a*, they are each furnished with two nuts e^1, e^2, which bear respectively against the upper and under surfaces of the table; the pieces are thus secured to the table and can be adjusted vertically as may be required by making the holes in the tables slotted; the distances of the pieces, *e*, *e*, from the centre of the table can be regulated at pleasure; *f*, *f*, are bent pipes screwed on to the upper ends of the pieces *e*, *e*, and furnished at their ends with metal nipples or tips *g*, *g*, which I prefer of platinum. The gas is caused to pass through wire gauze or other suitable appliance in the branch pieces, *e*, *e*, such as will render the apparatus secure from explosion and as heretofore employed. In each of the branch pieces, or attached thereto, are two stop cocks, e^3, e^3, to regulate independently, the one of the other, the quantities of the two gases employed as they pass to the jet. The two gases are led to the pieces *e* by six pipes *h*, *h*, h^1, h^1, two to each jet; the pipes *h*, *h*, all communicate with the union piece *p*, and the pipes h^1, h^1, with the corresponding piece p^1, and the pieces *p* and p^1, are connected with flexible or other convenient gasholders, such as have been heretofore employed, and which contain the gases to be used.

"In cases where it is found convenient to apply the gases in a compressed state, a uniform discharge or supply to the jets from the containing vessels or gasholders may be effected by a clock movement and escape valve of suitable construction, which shall permit the required quantities of the gases to pass to the jets, the area of such valve aperture constantly varying as the pressure decreases in the gasholder.

"The gases usually employed are oxygen and hydrogen, but for this latter coal gas or carburetted hydrogen may be substituted with advantage where it can be procured. As it is desirable that the lime should not be exposed to the action of the atmosphere, which would speedily render it unfit for use, it may be kept (after it has been shaped) in a glass or earthern-jar, close stopped, or in a box lined with tin foil or other impregnable lining, or the lime may be coated with an unctuous material, such as glycerine, linseed, or other oil, which, by closing the surface pores, prevents the absorption of moisture, and improves the illuminating quality of the lime.

"Having thus described the nature of this invention, and the manner of performing the same, I would have it understood that what I claim is the enclosing the lime or other suitable material used in such apparatus, as above mentioned, in a case or guard extending above as well as below the opening or place at which the jet or jets of flame impinge upon the lime or other suitable material, and placing a guard of wires at such opening, so that when the lime or material is caused to crack or decrepitate, by the action of the heat or otherwise, it may not fall down or out of the case or away from the action of the jet or jets of flame.

In addition to these, Mr. J. Copcutt claims, by his patent of May 20, 1858, an improvement in the preparation of the lime, by the addition of about 5 lbs. of sulphur to a ton of lime, the mixture being raised to a red heat in a covered crucible or oven, where it is to be kept at that heat for twenty-four hours, and is afterwards allowed to cool, and is then cut into pieces of suitable form for use. This patent is not, however, one of those purchased by the Lime-Light Company, but is, we believe, one of the subjects of a rival scheme under the title of "The Fitzmaurice Light Company."

Our practical readers will be able, from this description, to appreciate the extent to which their interests may be prejudiced by any of these inventions. Their success, even for fixed powerful lights, must greatly depend upon the steadiness of the light, upon which point some recent experiments at King's College are, we believe, not quite satisfactory; and no data have yet been given by which we can check any estimate of the cost at which oxygen and hydrogen can be manufactured on a large scale. Upon these subjects, we await further information before we can form any opinion as to the probability of the system being successfully adopted for any of the purposes to which we conceive it is applicable.

We are informed that the native oxide of iron to which we recently drew attention as being used in several gas-works in Denmark for the purification of gas, has failed to act during frosty weather, much in the same manner as Mr. Laming's mixture of oxide of iron and chloride of calcium failed in Mr. Evans's experiments in 1849. It has been suggested to us, that the complaints of the impurity of the gas of some of the metropolitan companies, for which no cause can be assigned, may arise from the same source, and the subject is well worthy of investigation. A great deal may be expected to be said about these mysterious occurrences whenever the Metropolitan Gas Inquiry is renewed, and it would be satisfactory if their origin could be previously ascertained.

As the time approaches for the renewal of the attempt to settle the question of the gas supply of the metropolis by Parliamentary interference, the delegates become more active, if we may judge by the reports of their proceedings. At their last meeting, the reply of the gas companies to the charges of the delegates sent to the Home Secretary was read, but no discussion took place on it, as Mr. Beal, the secretary, wisely suggested that a continuance of conflicting statements of grievances and replies thereto should not be persisted in,

and that the delegates should satisfy themselves with presenting to the Home Secretary the points on which legislation is desired, leaving to him to obtain the adhesion of the gas companies. We commend Mr. Beal's discretion in not attempting to make a rejoinder to the reply of the companies, and in being satisfied with the general declaration that he could answer it if he would; for the statements it contains are chiefly limited to matters of fact respecting which there can be no dispute; and, as regards the public lighting, which is now made the principal ground of complaint, the contradictions of the misrepresentations of the delegates are most complete. The assertion by the gas companies that, "up to 1842, no gas company had parliamentary sanction to lay pipes for the supply of gas in any portion of the metropolis already allotted to existing companies," and that competition was not subsequently sanctioned by Parliament except in districts where the companies had already laid down their pipes, fully accords with our previous statements to the same effect. In reply to the charge that the public are made to pay £50,000 a year in excess of a fair and reasonable price for the public lighting, the gas companies observe; "The price paid for a public lamp in very few cases exceeds 90s. per lamp per annum, whereas the gas consumed by the lamp is not less than 22,000 feet, and this at the price of 90s. does not equal 3s. per 1000 cubic feet, instead of 4s. 6d., which is the average price to private consumers." The companies, still more completely to refute the fallacy of the assertions of the delegates respecting the public lighting, refer to each alleged grievance separately, and show that in all cases where an advance on the former contract price has been made, there were special circumstances to justify it, and that in no instance is the price charged more than fair and reasonable. One or two of these statements will serve to prove the utter groundlessness of the charge that extortionate prices have been imposed since the districting arrangements have been effected. Thus, in the Westminster district, "the Chartered Company have to state that the contract at £3. 17s. 6d. *was put an end to by the parish itself;* and on the parish sending out a specification for a new contract, requiring 25 per cent. more light than in the former contract, the Chartered tendered, and were accepted at £4. 7s. 6d., whilst the price of the preceding contract, increased in proportion to the greater light required, would have amounted to £4. 14s."

The charge against the London Company, that in Chelsea they had raised the price for 173 lamps 20s. a year, is one of the strongest cases of grievance alleged by the delegates; but it is completely dispelled when the fact is made known that the lamps in question are in Han's Town, and that the price now charged—viz., £4. 10s. per lamp—is the same as that charged for the lamps in all other parts of the parish of Chelsea, which price has not been complained of.

In Marylebone, the Imperial Company supply 3200 lamps out of the 3400 in the parish, and they have not raised the price one farthing; whilst the Chartered, who light the remaining 200, are charged with extortion for having raised the price for those lamps to the same standard as the Imperial, though neither company receives 3s. per 1000 feet for the gas they supply to the public lamps.

In the Clerkenwell district, though no advance has been made in the price of the lamps, "*the parish has raised the rateable value of the companies' property from* £200 *to* £3294 *as respects the Imperial Company, and from* £150 *to* £2600 *as regards the Chartered.*"

The gas companies express themselves desirous to respond to the suggestion thrown out by the Home Secretary for an amicable and fair settlement of the matters in dispute, and will not object to clauses to the following effect being introduced into any bill for regulating the districts and the supply of gas to the metropolis:—"To prevent the companies from requiring in-coming tenants to pay for gas consumed by outgoing tenants, except in cases of collusion. To define the illuminating power of the gas. For the appointment of chemists to test the quality of gas. Also, as a matter of course, to incorporate the Gas-Works Clauses Act, 1847."

It is stated in the published account of the meeting that a long report of the engineer was produced, consisting of "an argument" in opposition to the views put forward by Mr. Barlow, in his letter to Sir G. C. Lewis. The "argument," as it is called, is nothing more than a tissue of abuse of the plan of amalgamation and its author, and it is remarkable only for the absence of any argument whatever. We do not grieve to perceive that Mr. Hughes is angered with the proposed scheme, for wrath usually denotes the absence of reasonable objection; and, in this case, it proves a correct indicator. He does not, however, fail—Mr. Hughes, indeed, seldom fails—to make public assertions that have but little foundation in truth, and, with his customary peculiar infelicity, he is especially virulent against the scheme of amalgamation because it does not sufficiently consolidate. Mr. Barlow's plan proposes to remove three of the existing gas-works from crowded localities—not because they are nuisances, but because they are inconveniently situated for receiving supplies of the materials of manufacture—but Mr. Hughes is for sweeping them all away: the main object to be effected by amalgamation, in his estimation, being "the concentration of the manufacturing establishments on one site." Mr. Hughes almost bursts into eloquence on the subject of the removal of gas-works—those "masses of pestilence"—and he inveighs with accumulated bitterness against the City of London Gas-Works, "which scents with its foul odours the busy neighbourhood of the Strand (?), and even invades the quiet seclusion of the Temple." Had Mr. Hughes been acquainted with the proceedings in both Houses of Parliament last session relative to that "mass of pestilence," he might have spared his grandiloquence, and have husbanded his sympathies for other occasions and for other objects. He seems to be ignorant that the City of London Gas Company applied to Parliament for the renewal of their Act of Incorporation, which was about to expire, and for the extension of their powers; that their bill was strongly opposed by the Commissioners of Sewers, and that the attempt to prove the works at Blackfriars a nuisance so completely failed, that both houses of Parliament sanctioned their continuance. Mr. Hughes may perhaps be astonished to hear that a memorial from 376 resident occupiers of houses in the neighbourhood was presented to the Lords' committee, in which "they have no hesitation in asserting positively that no injurious effects whatever, either upon the health of the inhabitants, or their property, result from the manufacture, storage, and distribution of the gas," and that even the men of law, for whom his sympathies are so strongly excited, sent a petition from their quiet seclusion in the Temple for the continuance of the works which are asserted by Mr. Hughes to emit foul odours detrimental to legal studies. When he finds himself mistaken with that part of the proposed plan of amalgamation which seems most objectionable to him, because it does not go far enough, and when he discovers that his eloquence and his sympathies have been misdirected, wrath may give way to reason, and we may hope soon to see Mr. Hughes an advocate of the plan that he now so angrily abuses.

The case of *Hipkins v. the Birmingham and Staffordshire Gas Company* (in which judgment has been given by the Court of Exchequer against the defendants, for having "suffered" the water from one of their gasholder tanks to percolate through the earth into a well upon an adjoining property), will have the effect of putting gas companies generally, and especially those who are under the Gas-Works' Clauses Act of 1847, upon their guard against similar infractions of the law. The case will, we believe, be carried to the House of Lords; but we apprehend little expectation is entertained of its being reversed. The 25th section of this Act imposes a penalty of £20 per diem upon companies thus offending; and penalties almost equally severe were introduced, upon the suggestion of the late Lord Shaftesbury, in the Acts of most of the gas companies incorporated before the passing of that Act. Twenty pounds per diem, at twenty years' purchase, are equivalent to a penalty of £146,000! if the fouling of the water cannot be cured, a responsibility not to be overlooked by any company in applying for parliamentary powers.

The notice in the last number of our JOURNAL of the original inventor of the modes of purifying gas, by lime and by metallic oxides, has excited much sympathy for his son, who is now reduced by illness to solicit charitable aid for the support of himself and family. We have since gathered some further particulars respecting Edward Heard and his inventions for purifying gas, which give additional interest to his case, and show more distinctly the pitiable condition of the ingenious and meritorious inventor, who, having spent all his means in obtaining a patent, and in perfecting his invention, saw other men profit by his labours, and found himself unable to vindicate his rights because he had not the means to purchase protection in a court of law. The original "Petition of Edward Heard, chemist, to the Gaslight Companies of the United Kingdom of Great Britain and Ireland," which is now before us, particularly

sets forth his claims to be the inventor of the process of purifying gas by lime, and mentions that he was engaged by Winsor, in 1804, to lecture at the Lyceum theatre "on the application of coal gas to the purposes of artificial light and heat." No process of purification having been then contemplated by Winsor, the offensive smell emitted by the crude gas during its combustion sadly counteracted the efforts of Heard's eloquence, and "the general opinion then was that it would never answer, or be adopted as a source of artificial light." Heard directed his attention to discover the cause of the smell, which was then unknown, and, having ascertained that it was occasioned by the presence of sulphuretted hydrogen, his chemical knowledge enabled him to devise the means of freeing the gas from that impurity by lime. He had an apparatus constructed in 1805 to test the efficacy of lime as a purifying agent, and in June of the following year he obtained the patent, the specification of which was published in our last number.

It thus appears, as stated in his petition, "his discovery was made and patented to him nine years before the formation of any gas company; consequently, in the application of lime to its purification, those companies were evidently indebted to petitioner's previous labours for their first knowledge of the efficacy of lime as a purifier of coal gas, and the consequent advantages they have since derived from its manufacture." In 1819, when his patent was about to expire, Heard, finding that his invention was becoming daily of more importance, gave notice in the *Gazette* of his intention to apply to Parliament for a renewal of his patent; but, having no friends to support him, and no funds to meet the cost of passing a bill through Parliament, he was obliged to abandon his invention, without having gained a farthing, and had the mortification to see others reap the advantage of his ingenuity, whilst he was impoverished. It was under these circumstances that Edward Heard, some years afterwards, petitioned the gas companies for relief, when, in the decline of life, and with a large family, he was reduced to a state of indigence. In that affecting appeal, "he humbly trusts that, although from lapse of time he has lost all legal claim on gas companies, yet that a moral sense of obligation to petitioner will still be felt," and "that they will view his claims, however late urged, with that liberality of construction and consideration of the cause of the present appeal, as to influence each gas company to award him such moderate gratuity as may collectively amount to a sum sufficient to maintain him in his old age, and leave some little provision for his family at his decease."

That appeal, we regret to say, was not responded to, and poor Heard died destitute, leaving his children without maintenance. One of those children, Francis Heard, now makes a similar application for help, founded on his father's unrequited claims. Francis Heard is a meritorious journeyman cabinet-maker. He has worked hard to support himself and family, but, being afflicted with illness that will prevent him in future from working much at his trade, he is now in want. A few gentlemen who know his circumstances have undertaken to receive subscriptions in his behalf, for the purpose of raising a small fund to set him up in business as an upholsterer. It is a sad tale of distress, which in this country only requires to be known to be alleviated; and we feel confident that those who, from an imperfect knowledge of the case, disregarded the supplications of the father, will gladly avail themselves of the *locus penitentiæ* afforded by the appeal of his son.

Correspondence.

THE GRIEVANCES OF THE METROPOLITAN GAS CONSUMERS.

SIR,—In your JOURNAL of the 17th you publish a document from the *Monetary Times* of the 30th of December, said to be an extract from a communication made by the delegates to the Home Secretary, on the subject of the "Grievances of the Metropolitan Gas Consumers."

As a member of the Board of Works for the Westminster district, I beg to call your attention to the inaccuracy of this document, so far as it relates to this district; and, probably, the statements in the same article respecting other parishes will be found equally erroneous, and at variance with that spirit of honesty and truth which have all along characterized the proceedings of the gas managers.

The document states,

"That the following are circumstances in which the prices of gas for public lighting have been raised since the districting:—

"In the Westminster district the Chartered Company raised their price from £3. 17s. 6d. to £4. 14s. per lamp, and although they are now lighting this district with cannel gas at £4. 5s. per lamp, they will not agree to furnish any stipulated quantity of gas."

This statement, Sir, is not only untrue but positively dishonest, and perhaps you will permit me to show these "grievance-mongers" how a plain tale may be told.

The contract price at the time of the districting was £3. 17s. 6d. per lamp, as stated in the "document;" and, no doubt, it would have remained at that price until this day, but the members of the Westminster Board gave the companies notice, at Midsummer, 1857, to terminate their contracts at Christmas; and, in the interim, they drew up a fresh contract, introduced clauses of a most arbitrary character, and decided to have gas of a different quality, and of one-fourth more illuminating power, than was stipulated for in the previous contracts. We are, therefore, now getting one-fourth more light at an advance of 7s. 6d. per lamp per annum; in short, instead of paying more since the districting was carried into effect, we are paying less in proportion to the light received. The other statement, respecting the refusal of the Chartered Company since the districting to agree to the quantity of gas, is also a delusion, as the old £3. 17s. 6d. contract, previous to the districting, contained no such stipulation.

The hat is just now going round, and it is necessary to create an expectation amongst the audience, and, if possible, to persuade them that 10 or 12-candle gas will be secured to them at the price of 8 candles. These "gas managers" have doubtless received their inspirations from that great commercial reformer of the fifteenth century, "Jack Cade," who led his admiring, though deluded, followers to expect seven halfpenny loaves for a penny, "and all the realm should be in common."

A MEMBER OF THE WESTMINSTER DISTRICT BOARD.

Westminster, Jan. 28, 1861.

HEARD'S PATENT OF 1806.

SIR,—I have had my attention called to an article in your JOURNAL for Jan. 17, 1860, headed "Nothing New under the Sun," in which it is pretended that my process for the use and renovation of hydrated oxide of iron has been forestalled by a patent taken out more than fifty years ago by a Mr. Heard. It is, perhaps, hardly worth my while taking notice of this article, as it can deceive none but the most unreflecting; but still, as your repeated attacks on my said patent may have some influence on the class I refer to, I will show that it is absurd to suppose that this old patent in any way forestalls mine. I will now examine the specification (as you have given it) of this old patent, which you say is so marvellously lucid and precise. I find it is for *mixing or stratifying lime with the coals in the retorts*, or for passing the gas OVER (not through) lime placed in an *iron tube*, or other vessel, *exposed to the heat*. This is the patent which it is pretended forestalls mine for using and renovating hydrated oxide of iron, viz.—mixing or stratifying lime with the coals to be distilled; and this appears to be all that the patentee claims. It is true he goes on to say that he has reason to conclude that all the *alkalies*, or alkaline earths, or *other similar earths*, if any one knows what they are, or metals or their oxides which possess a sufficient affinity for sulphur, such as manganese, zinc, lead, iron, copper, &c., are calculated in a *greater or less* degree to divest gas of its smell; but he does not say that all these things will purify gas effectually, and if he did, he would have made a false and misleading statement; but he only says that they are calculated in a greater or less degree to do so. Now, such a general statement as this, that a great variety of things are more or less effective, can give the public no information as to what could really be practically used to purify gas beneficially, neither is it a publication that would prevent a patent being held for any particular thing that might happen to be included in such a comprehensive category; and, instead of limiting his statement that the alkalies, the alkaline earths, and other similar earths, or the metals and their oxides, including their mineral ores, are calculated in a greater or less degree to deprive gas of its offensive smell, he might equally well have said that all or half the things in nature are calculated more or less to purify gas, and the public would have received just as much information from this statement as the other. How absurd is it, then, to say that an invention for purifying gas, consisting of two or three parts, and making a useful and valuable whole, is forestalled if a single part of it has happened to be included in a general and comprehensive list of things, not one in a hundred of which will really purify gas at all beneficially, and which it is not asserted that they will, but which are merely supposed or said to be calculated in a greater or less degree to do so! The whole statement of Mr. Heard, so far as any practical information to the public is given, only amounts to this—namely, that things which have an affinity for sulphur are more or less calculated to deprive gas of the sulphur it contains; and no doubt this is a great discovery, and worthy of being raked out of its musty hole in the patent-office. And now let us look at what encouragement the public would have to experiment on in this specification, supposing they begin with the metals, such as copper, zinc, lead, iron, manganese, &c., which have such an affinity for sulphur as to be more or less calculated to purify gas. Why, this statement includes all the

metals known: these are to be stratified with the coals. Only fancy, gentle reader, stratifying sheets or ingots of silver, copper, or lead with the coals in the retorts, or if, instead of placing the metals in sheets, &c., some mince-meat process were adopted, which is not described, for chopping them up before stratification. Why, the whole thing is too ridiculous to be answered gravely; and if, instead of the metals, they had used their mineral ores or oxides, either stratified with the coals in the retorts or placed in red-hot tubes, or other vessels, for the gas to pass *over* them, not through them, which is the method the patentee describes and adopts for lime—this would have been but little less absurd than stratifying the silver or copper plates with coals in the retorts; and certainly the writer of your talented article must have a most unlimited idea of the gullability of your readers if he thinks he can persuade them that this old patent of Mr. Heard's in any way forestalls mine for the repeated use and renovation of the hydrated oxide of iron, whereby the same oxide may be used over and over again for thirty or forty times.

F. C. HILLS.

Chemical Works, Deptford, Jan. 27, 1860.

Register of New Patents.

1699.—FREDERICK COLLIER BAKEWELL, of 6, Haverstock Terrace, Hampstead, in the co. of Middlesex, for "*Improvements in extracting oils from coal and other minerals.*" A communication from abroad, from David Alter and Samuel A. Hill, of Pittsburgh, in the United States of North America. Patent dated July 19, 1859.

This invention consists in extracting oil and volatile oleaginous products from coal, bituminous shale, and other minerals, by a low heat in retorts to which a rotary or other equivalent motion is given during the process of distillation, for the purpose of subjecting the contents of the retorts to a more uniform temperature, and thereby expediting the process and increasing the amount of the products.

The great difficulty hitherto experienced in the extraction of oil from coal and other bituminous substances has arisen from the generation of permanent gas instead of condensible oleaginous vapour during the process of distillation, which result is dangerous to works not constructed for the manufacture of inflammable gas, and detrimental to the production of oil. The object of this invention is to overcome that difficulty by applying a low degree of heat to the retorts containing the substances under treatment, in such a manner that it may be equally diffused through the whole mass; and this is done by giving to the retorts a slow rotary or other equivalent motion, whereby all the parts become equally exposed to the action of the heat.

In carrying out this invention a cylindrical metal retort is preferred, but retorts of other forms and of other suitable material may be used. The drawings attached to the specification show a cylindrical retort, which is set horizontally in a furnace of any suitable construction in such a manner as to admit of its being freely turned on its axis, with both ends projecting from, or at least flush with, the face of the front and rear walls of the furnace. The retort is closed at both ends with end-pieces, each of which has a tubular axis or journal projecting from its centre. The axis of the front is supported on an iron arch, or other device, as a journal-block, and the axis of the rear end of the retort is supported on a frame as its journal-block. The retort, thus supported, can revolve freely on its axis. The axis of the rear end of the retort is tubular, and has openings at both ends, one of which communicates with the interior of the retort, and the other end is made spherical externally, and very smooth. This end works in the conical end of a pipe, into which it fits so closely as to form a close joint, like a ball and socket, to prevent the productions of distillation from escaping. This pipe inclines downwards, so as to prevent the return of condensed vapour into the retort, and it terminates in a large horizontal pipe or main, which receives the products of distillation and conducts them to a condenser. This main extends along the series of retorts set side by side, and serves to remove the products of distillation from the whole series.

The aperture at the rear end of the retort is prevented from being choked up by means of a moveable head, which is placed inside the retort near the back. This head consists of a disc of iron, somewhat smaller in diameter than the inside of the retort, and is supported in its place near the end by a rod, which is fixed to the disc and passes horizontally through the centre of the retort and through the perforated centre of the front axis. To this end of the rod a handle is attached by which the disc of iron may be moved backwards or forwards, for which purpose a screw is cut on that part of the rod to work in a female screw in the perforated axis. The front end of the retort is double, and is lined with clay to keep in the heat. The space between the rear end and the disc or moveable head serves also the purpose of retaining the heat. In the front is an opening or man-hole for charging the retort and for removing the residuum, which opening is closed by a lid fastened and luted in the usual manner.

A slow revolving motion is communicated to the retort by means of a large bevel-wheel, firmly attached to the axis between the journal-block or frame at the rear end of the retort and the spherical end of the said axis, which wheel gears into a smaller bevel-wheel that is fixed to and moved by a shaft, extending horizontally at the back of the series of retorts, and communicating motion in a similar way to each retort of the series. The method of communicating motion to the retorts may, however, be varied as convenience suggests. The rotary motion communicated to the retort in the manner described fully accomplishes the requisite objects of agitating the contents during distillation, of exposing them to a uniform heat, of maintaining the retort itself of an even temperature, and of expediting the process of distillation at a low red heat. But, should it be found convenient to give the retort any other equivalent motion, or to intermit the motion at short intervals, it may be done if the substantial object of the invention be attained.

In order to increase the rapidity of the process of distillation, and the yield from a given quantity of materials, it is desirable that the coal or other mineral substance to be operated upon should be reduced to powder, or broken small before being placed in the retorts. The retorts are then charged about half full, and the lid, being closed and luted, the heat of the fire in the furnace is so regulated as to keep the retort at a low red heat—say at about 800° Fahr., or less, if permanent gas be largely evolved at that temperature. The retorts are made to revolve about once in every twenty seconds, but should the heat increase, the rotation of the retorts is accelerated, to prevent injury to the products of distillation, and to diminish the generation of gas, the rotation of the retorts being continued during the whole process of distillation. By this means the heat is much more rapidly transferred from the retort to its contents than is possible with the use of stationary retorts; the distillation is effected with a much lower degree of heat and the process is completed in much shorter time, without injury to the products of distillation or the generation of any large quantity of permanent gas.

Novelty is not claimed in this invention for the use of retorts so constructed as to rotate on their axis; but what is claimed in this invention is, the destructive distillation of coal or other bituminous substance, for obtaining the liquid products thereof in the form known as coal oils, by combining the employment of a temperature not exceeding a dull red heat with the use of retorts so constructed as to have a rotary or other equivalent motion, in substantially the same manner and for the purposes hereinbefore set forth.

1731.—WILLIAM EDWARD NEWTON, of 66, Chancery Lane, London, civil engineer, for "*Improvements in extracting oil from coal and other substances yielding pyrogenous oils.*" A communication from Franklin W. Willard, of New York, U.S. Patent dated July 25, 1859.

In the processes heretofore used for the destructive distillation of coal and other substances yielding pyrogenous oils stationary retorts have been used, and it has been found necessary and best to use a low degree of heat, in order to avoid the production of permanent gases which cannot be converted into oily vapours. But, by using a stationary retort, its contents are necessarily exposed to different degrees of heat, so that one portion of the charge evolves permanent gases, and the other portion oleaginous vapours, thereby causing a loss of material, as the object of the process is to form oily vapours that are susceptible of condensation, and the operation by the use of a low temperature is of course a slow one.

The object of the present invention is the rapid production of the largest quantity of oleaginous vapours without any considerable generation of incondensible gases, and this object is effected by imparting to the retort or distilling vessel a rotary or other equivalent motion, so as to agitate its contents and expose all portions of the charge equally to the fire. The distilling operation is to be carried on with a low red heat—say about 850° Fahr. By this method, the quantity of oily vapours produced is much greater, and the time occupied in extracting them is much less than by any of the modes heretofore practised.

The drawings attached to the specification represent a cylindrical retort set in brickwork, leaving a flue-space or chamber entirely round the retort, through which chamber the flame and products of combustion from the fire-place circulate, and make their escape at the chimney. The retort has for its rear bearing or journal a hollow shaft, the front end being supported by two friction-rollers. The retort has a rotary motion imparted to it by means of a large gear-wheel on the shaft engaging with a worm or endless screw on a horizontal shaft, or in any other suitable and convenient manner. The retort is filled with a charge of coal, and is exposed, while revolving, to a temperature of about 850° Fahr., and the oily vapours that are evolved escape through the hollow shaft, and are conducted into any proper condensing apparatus.

In order to prevent the escape of heat from the retort, and also to prevent the ends of the retort from being destroyed by the action of the fire, double heads are used, the space between the ends of the retort and the extra heads being filled with clay, or other non-conductor of heat, braces or studs being used to prevent the springing or warping of the parts.

To obviate the liability of clogging of the strainer of the hollow shaft with particles of coal, the rear false head is hung by a short shaft or stud, and a circular plate provided with a flange or lip, and having a central aperture larger than the end of the shaft. While the head and its shaft revolve with the retort, the plate remains stationary, and in contact with the bottom of the retort, and thus prevents the coal or other substance which occupies the lower portion of the retort from passing into the hollow shaft. It is evident that it will be necessary to construct both the false head and the eccentric plate in sections, in order that they may be introduced either through the manhole or through the door of the retort.

The claims are for—

1. The process described for extracting the liquid products from coals or other substances containing or yielding pyrogenous oils by the use of a retort so constructed and operated as to have a rotary or other equivalent motion for agitating its contents and exposing all portions of the charge equally to the heat, in combination with the use of a low red heat of about 850° Fahr., as above set forth.

2. Forming double ends or heads to the retort with clay or other non-conducting material between the extra heads and the ends of the retort, and preventing them springing or warping, by means of stays or studs as described.

3. The use of the circular plate hung upon the false head, and operated, as described.

1742.—JOHN DAVIES, of Tetbury, in the co. of Gloucester, machinist, for "*A new or improved self-adjusting ventilating apparatus.*" Patent dated July 27, 1859.

This invention consists of a ventilator formed of two tubes or passages, constructed with valves situated one above the other, and placed at the upper part of the wall of the room to be ventilated, and communicating between the said room and the external air—the heat and vitiated air escaping through the upper tube, and the fresh air entering through the lower one.

PROVISIONAL PROTECTION

HAS BEEN GRANTED FOR THE UNDERMENTIONED INVENTIONS.

2894.—JOHN STONYER and JOHN WHITMEE, both of Ray Street, Clerkenwell, London, machinists, for "*Improvements in fluid meters, such improved meters being applicable to purposes in addition to the ordinary purposes of fluid meters.*" Dec. 20, 1859.

92.—EDWARD HARRISON and JOSHUA SCOTT, of Oldham, Lancaster, gas-meter manufacturers, for "*Improvements in gas-meters.*" Jan. 13, 1860.

97.—JOHN MUSSELWHITE, of Devizes, Wilts, accountant, for "*Improvements in apparatus for transferring fluids.*" Jan. 13, 1860.

98.—JOHN EUNSON, of Wolverhampton, in the co. of Stafford, engineer, for "*Improvements in refrigerating apparatus.*" A communication. Jan. 13, 1860.

124.—JOB GOULSON, of 37, Ponsonby Place, Vauxhall Bridge Road, Westminster, for "*Improvements in gas-meters.*" Jan. 17, 1860.

NOTICES HAVE BEEN GIVEN OF INTENTION TO PROCEED WITH THE UNDERMENTIONED INVENTIONS.

2096.—NATHAN DEFRIES, of 5, Fitzroy Square, London, gas engineer, for "*Improvements in gas-meters.*" Sept. 14, 1859.

2121.—SAMUEL NEWMAN RODIER, of Prospect Cottage, Strand-on-the-Green, Chiswick, for "*Improvements in the regulation of gas to burners which he calls 'Rodier's regulating gas valve.'*" Sept. 17, 1859.

2136.—JOHN COURT, of Brompton Row, London, for "*Improvements applicable to gas and other lamps and lights, and also gas-stoves for effecting more complete combustion therein.*" Sept. 19, 1859.

2150.—GEORGE DANNETT ROBINSON, of 15, Church Street, Islington, London, for "*Improvements in apparatus for regulating the pressure of gas and other fluids.*" Sept. 21, 1859.

2184.—CHARLES COWPER, of 20, Southampton Buildings, Chancery Lane, London, for "*Improvements in mixing or combining and deodorizing oil made from gas tar and other oils.*" A communication. Sept. 27, 1859.

Legal Intelligence.

COURT OF QUEEN'S BENCH.

WEDNESDAY, JAN. 18.

(*Sittings in Banco, before the* LORD CHIEF JUSTICE, *and Justices* WIGHTMAN, CROMPTON, *and* BLACKBURN.)

THE NEW RIVER COMPANY, *Appellants;* JOHNSON, *Respondent.*

This was a case stated for the opinion of the court by the magistrates of Hertford, under the 20th and 21st of Victoria, cap. 43; and it raised a very important question as to the rights of owners of wells in that species of property. The case was partly heard last term, but the further hearing had to be adjourned in consequence of the want of time for the conclusion of the arguments.

Mr. BOVILL, Q.C., and Mr. BUSHBY appeared for the appellants; Mr. WOOLLETT and Mr. C. TAYLOR for the respondent.

Mr. BOVILL stated that this was an appeal on behalf of the governor and shareholders of the New River Company against an order of the magistrates for the borough of Hertford, whereby a sum of £2. 16s. was awarded to the respondent, Sarah Hankin Johnson, as damages for injury done her by abstracting water from her well. It appeared that the company were in and by their local Act, entitled "An Act to enable the New River Company to construct certain sewers, drains, and other works in and near the town of Hertford, and for other purposes (17 and 18 Vic.)," and the Acts incorporated therein, empowered to construct certain sewers, drains, and other works, commencing in the parish of St. Andrew, Hertford, along the public highway known as the North Road; the road in question being vested in trustees and forming part of the Walton Trust. Mrs. Johnson, the respondent, happened to be the owner of two houses in North Crescent, Hertford, which abuts the public road, along which the sewer of the company was partly carried; and shortly after the works of the company were opened, she and her neighbours found that their wells were nearly emptied; she therefore summoned the company before the local magistrates, and although it was stated that Mrs. Johnson and her neighbours had only to sink their wells a little in order to obtain as good a supply of water as previously, damages were awarded to her of £2. 16s. 7d., and costs. It was against this order the company appealed. In the company's local Act was incorporated the Water-Works Clauses Act, 1847 (10 Vic., c. 17), by the 12th section of which the company were authorized to construct such works as those in question, "provided always, that in the exercise of the said powers, the undertakers shall do as little damage as can be, and shall make full compensation to all parties interested for all damage sustained by them through the exercise of such powers." The learned counsel argued in support of the appeal, that this was a case of *damnum absque injuria*. He relied upon the decision in *Chasemore v. Richards* as deciding the first point—namely, that the principles which apply to the right to water flowing in a certain and original course, whether in an open and visible stream or in a subterranean channel, are inapplicable to water percolating through underground strata. As to the second point, the case of *Acton v. Blundell* (12 M. and W.), which decided that an action will not lie against a landowner who is carrying on mining operations on his own land, and happens thereby to drain his neighbour's well, was conclusive.

Mr. WOOLLETT, for the respondent, maintained that the order of the justices was perfectly good, and that the company were liable under the 12th section of the Water-Works Clauses Consolidation Act, which was incorporated with the local Act of the company, to make compensation for the damage sustained by the respondent. Their liability in this respect might be argued from two points of view: either the company had altogether intercepted the water on its way to the respondent's well, or, being there, they had abstracted it by their drain. In either alternative the respondent was entitled to compensation. As regarded the first—namely, the interception of the water—this case was plainly distinguishable from *Chasemore v. Richards;* for although, undoubtedly, that case decided that no man could acquire a right to the water which had percolated through the soil of another, still that was a decision as between adjoining owners of land. Here the company were not the owners of the land on which the drain was erected. But supposing they were owners, or at least had the authority of the owners for their acts, it was plain that, although they might in that capacity have power to intercept percolating water on its way to the respondent's well, they would have no right to abstract it once it got there, and from soil over which they had no right of ownership. Indeed, the probability was that Mrs. Johnson's well was fed by water percolating from a variety of directions; and therefore, although the supply might be cut off in one direction, it would not cease from others. At the same time it was contended that by the 12th section of the Water-Works Consolidation Act, which was incorporated with the local Act, the company was expressly prevented from carrying on their operations so as injuriously to affect the property of others without making them compensation. The section said—"Provided always that in the exercise of the said powers the undertakers shall do as little damage as can be; and, in all cases where it can be done, shall provide other water-places, drains, and channels for the use of adjoining lands, in place of any such as shall be taken away or interrupted by them, and shall make full compensation to the party interested for the damages sustained by them through the exercise of such powers." Supposing, therefore, *Chasemore v. Richards* to be against them, he (Mr. Woollett) contended that his client's interests were safe under that clause in the Act.

Justice CROMPTON: There are a great variety of cases which decide that the injury thus done to a person's property must be such as for which an action would lie. Now, would an action lie here, supposing the acts complained of were the acts of an adjoining owner?

Mr. WOOLLETT said he apprehended that the decisions in question had only reference to the interpretation to be put upon the 68th clause of the Railway Clauses Consolidation Act. A much wider interpretation must be given to the section of this Act. Surely the Legislature, in granting powers to make compensation, must have had in view that which was the most likely damage that could result from the operation of the Act. In one case the rights only of adjoining landowners were dealt with; in the other, the rights of the public. He asserted that the only question for consideration was the damage sustained through the exercise of the powers granted by the Act of Parliament.

Justice CROMPTON: How is this case, Mr. Woollett, to be distinguished from *Acton v. Blundell?*

Mr. WOOLLETT said it was doubtful whether the second proposition laid down in that case was good law. Mr. Phear, in his treatise on "The Rights of Water," says, at page 36:—"Obviously the Chief Justice (Tindal) travelled beyond the limits of his own principle when he tried to make it entitle the owner of the shaft to all the water which he could drain from the well; in reality it only gave him such water as came to the shaft naturally, and not that which came from his neighbour's well (and was therefore already his neighbour's property) to supply the exhaustion which he artificially produced. It would seem, therefore, that the second proposition affirmed in *Acton v. Blundell* was not good law, although, as it remained unreversed, and had never yet been overruled by a competent court, it must be considered as judicially binding in parallel cases."

Mr. BOVILL was not called on to reply.

Chief Justice COCKBURN in delivering the judgment of the court, said: I think this order must be quashed. The recent decisions fully establish what is the correct view we are to take of Acts of Parliament when they give compulsory powers to interfere with the rights of property and provide for compensation—namely, that a party shall not be damnified by having his right of action taken away, and that therefore, unless the company are doing something which but for the compulsory powers they could not do, they shall not be liable to make compensation. The question, therefore, here is, whether the company have interfered with the rights of the respondent in such a way as would give a right of action? Mr. Woollett says that they have interfered with the water in its coming to the well, and that they have drawn it away after it has got there. Now, as regards the first injury, *Chasemore v. Richards* is an authority to show that the abstraction of water percolating through the earth is not a cause of action, and so in this case the abstraction would not give a right of action, and therefore there should be no compensation under the statute. Then as to abstracting the water after it has got to the well, *Acton v. Blundell* is an authority to show that no action will lie for that. It would be a very great pity to throw any doubt upon the proper construction of such clauses under these Acts of Parliament. Where there could be no right of action, it would be very mischievous to hold that any right to compensation is given by statute, unless upon the clearest language.

The other learned judges concurring, the order of the magistrates was quashed, but *without* costs.

COURT OF EXCHEQUER.

MONDAY, JAN. 16.

(*Sittings in Banco before the Lord Chief Baron* POLLOCK, *and Barons* MARTIN *and* WATSON.)

HIPKINS *v.* THE BIRMINGHAM AND STAFFORDSHIRE GASLIGHT COMPANY.

This was a special case, stated by order of Baron Bramwell for the opinion of the court, as to the liability of the defendants for injury caused to the plaintiff by reason of their suffering certain washings produced in the manufacture of gas to flow into the plaintiff's well.

It appeared that in September, 1858, the plaintiff commenced his action against the company to recover damages for the injury sustained by him, and the first count of his declaration alleged that before and at the time of the committing by the defendants of the grievances mentioned, the plaintiff was possessed of a reservoir or place for water—that is to say, a well—and of certain water contained therein, situate in the parish of West Bromwich, in the county of Stafford, within the limits of the said statute; and the defendants were the owners of certain gas-works in the parish and county aforesaid, and the defendants caused and suffered to be conveyed and to flow into the said well a certain washing or thing produced in the making and supplying gas at and from the said gas-works of the defendants, whereby the water contained in the said well became and was fouled, corrupted, and rendered useless, by reason whereof and by force of the statute the defendants became liable to pay the plaintiff the sum of £200. The second count in the declaration charged the defendants with negligence at common law.

The defendants pleaded several pleas, formally denying their guilt and liability, and issue being thereupon joined, this special case was stated.

Mr. SCOTLAND and Mr MACNAMARA appeared for the plaintiff; and Sir FITZROY KELLY, Mr. WHATELY, Q.C., and Mr. PHIPSON, for the defendants.

The case as stated for the court was, that the plaintiff was owner of two houses in Jervoise Street, West Bromwich, in the county of Stafford. In 1857 he sunk a well in one of the gardens, and it continued to be supplied with pure water until it was polluted by the foul water from the defendants' premises. The defendants were incorporated under the 6th George IV., cap. 79, and the 8th and 9th Victoria, cap. 66. The 106th section of the latter Act provided that if the company shall at any time cause, or suffer to be conveyed or flow into any stream, reservoir, aqueduct, pond, or place for

water, within the limits prescribed by the Act, any washing, substance, or thing produced by the making of gas, whereby the water shall be fouled or corrupted, they shall be liable to a penalty of £200. The 161st section enacted that the said penalty of £200 should be recoverable with full costs of suit in any of the superior courts, providing that the same were sued for within six months after the offence in respect of which such penalty should have been incurred; and the following section enacted "that in addition to the said penalty of £200 (and whether such penalty shall have been recovered or not) the company shall forfeit the sum of £20 (to be recovered in like manner and with the like proviso as to the time for suing for the same) for each day such washing, substance, or thing shall be conveyed or shall flow as aforesaid, or the act by which such water as aforesaid shall be fouled or corrupted shall continue after the expiration of twenty-four hours from the time at which notice of the offence shall have been served on the company by the person into whose water such washing, substance, or thing shall be conveyed or shall flow, or whose water shall be fouled or corrupted thereby, and such penalty shall be paid to such last-mentioned person." The plaintiff's well was within the limits of the Act 8th and 9th Vict., cap. 66., and about forty-five yards distant from the gas-tank. In 1852 the land was selected by defendants' engineer as a fit place for the erection of a gas-tank, and they purchased the land for the purpose, containing about 10,000 square yards. The defendants knew the mines in the neighbourhood had been worked, but they ascertained from their engineer that the intended site of the tank was upon a "fault" composed of red sandstone rock, and they had reason to believe the "fault" extended under the entire of the land purchased. The defendants did not know the mines had been worked under or near any part of their land. The company began to erect the tank in 1853, and it was completed in 1854. The tank, which was circular, was erected on solid sandstone rock, excavated for the purpose ten or twelve feet; the diameter of the tank was 132 feet; the total depth of excavation was 32 feet. The tank was constructed in the usual and proper manner, of the usual materials, and with due care. The floor of the tank was puddled, the puddling being on the solid rock; the floor and sides were of brick. The tank, when finished, was perfectly water-tight, and continued so until the cracking of the floor afterwards mentioned. The erection of the tank did not add any superincumbent weight upon the soil, but on the contrary the area on which it stood was lightened 6000 tons, as compared with its state before the excavation. On the 6th July, 1858, it was found that the water was sinking in the tank; on pumping it out a crack was found in the floor about half an inch wide, commencing near the centre and extending north-east to within about six feet of the wall of the tank. The brickwork and puddling were taken up, and a corresponding fissure was found in the rock, about three inches wide, and in some places five feet deep. The floor of the tank was perfectly level as when built, and there was nothing to show that the fissure had been caused by the operations of the defendants. On the 7th July, before the tank had been pumped out, some of the water had found its way, by percolation, to the plaintiff's well, and rendered it unfit for use. It was afterwards ascertained that the thick coal measures had been worked on the north-west side of the company's land, and under rather more than half of it; the remainder, including where the tank stood, was on a "fault" of solid sandstone. The coal had been worked up to it, and within a yard of the north-west wall of the tank. These workings were completed in 1838, and would probably have caused no injury to the tank or land on which it stood if there had been no subsequent working of adjacent mines. It was also found that other measures of coal and ironstone lying underneath the thick coal, and also some ribs and pillars which had been left in adjacent mines, had been worked; these workings were carried on from 1848 to 1855, and extended within sixty yards of the north-west wall of the tank. There were cracks in the company's boundary walls and in the adjacent cottages. These cracks and the fissure in the tank might have been occasioned by the last-mentioned mining operations. The question therefore was, whether the defendants were liable under the circumstances.

Mr. SCOTLAND, for the plaintiff, said this was the case of damage arising from the operations of a company carrying on a noxious trade for their own benefit. The first count of the declaration was founded on the 160th section of the 8th and 9th Vic, c. 66, which rendered the company liable to forfeit the sum of £200 if they at any time caused or suffered any washing, substance, or thing produced by making or supplying gas to flow into any stream, &c. He contended that by the words "cause or suffer to be conveyed or to flow into," the defendants were liable if they did not prevent it from flowing, although, perhaps, on the other side it would be argued that the company were not liable unless they "knowingly and willingly" permitted or suffered the injury. But he apprehended that the court would take the ordinary grammatical construction of the words, which were in the alternative, "cause to be conveyed or suffer to flow." According to Johnson, "suffer" meant to "allow," "not to hinder;" therefore the company were bound to prevent this injury; and if they did not, they were liable, from whatever cause it proceeded.

Baron MARTIN: The company being established for the purpose of profit to themselves.

Mr. SCOTLAND said the section to which he referred was a contract between them and the public. Take it as a contract, would it be any answer to say the accident was inevitable? The latter part of the section provided in the case of any injury arising from the act of the company, and showed what was the proper construction of the earlier portion. The 162nd section provided for the case of knowledge on the part of the company, and imposed an additional penalty.

The LORD CHIEF BARON: The penalty is imposed totally irrespective of the consideration whether the evil could be remedied in twenty-four hours or not.

Mr. SCOTLAND said the company were insurers, and rendered so by their own Act, so that no injury might arise to any one by reason of their works One of the points for argument stated on the other side was, that a well was not a place for water within the meaning of the Act; but he apprehended that that would hardly be contended for.

The LORD CHIEF BARON said the court would hear the case for the defendants on the first count before the learned counsel for the plaintiff proceeded to the second count.

Sir F. KELLY, for the defendants, submitted that, as the Act of Parliament under which these proceedings were instituted imposed a penalty, it must be construed strictly. The construction of the plaintiff's tank was necessary and lawful, and was done in a usual and proper manner. The workings in the mines had been suspended sixteen years before. Three years after the tank was constructed the plaintiff sunk his well. The mischief was occasioned by the acts of a stranger unknown to the defendants, and which they could not prevent.

The LORD CHIEF BARON: If he had a right to work the mines he was not a stranger; if he were a trespasser it would be different. If he had no right to work the mines, the company should bring an action against him; if he had a right, they ought not to have placed their tank there.

Sir F. KELLY said the word "suffer" employed in the section meant to permit someting which the defendants had power to prevent. Here the act was one which they could neither physically nor legally prevent. To hold them liable would be grossly unjust. A well was not a place for water within this Act In the former Act, 6 Geo. IV., c. 79, s. 64, a well was expressly mentioned: "any stream, reservoir, canal, aqueduct, feeder-pond, springhead, or well, or any dam," &c. But it was omitted in the latter Act. It might be that the Legistature considered the defendants ought to be liable for injury to surface water which they could see and ought to protect, but that it would be unjust to hold them liable for injury to underground water, of the existence of which they might be ignorant. The defendants were acting under their Act, and were not liable unless for negligence.

Mr. SCOTLAND was heard in reply, and submitted that the doctrine that penal statutes must be construed strictly was now exploded, and the court must look to the real meaning of the words employed by the Legislature.

Baron MARTIN: The Legislature says to the company, "If you take the benefit of the Act, you must ensure the public at large against accidents of this kind; you shall absolutely prevent it."

Mr. SCOTLAND said in that case *bonâ fides* was no answer to the action.

The LORD CHIEF BARON, in delivering judgment, said: I am of opinion that the plaintiff is entitled to judgment on the first count, although I did not come to that conclusion on first looking at the case. Undoubtedly, on general principles, when a thing is declared to be an offence, to constitute guilt the mind must go along with the act; the act alone does not constitute guilt unless the mind goes with it. If we were considering whether the act complained of here amounted to an offence in the ordinary sense, the argument in favour of the defendant would be very strong; but the Act declares the matter shall be an offence, whether the company have notice or not. These clauses were, I take it for granted, drawn, not in favour of the company, but against them, by persons who watched their proceedings, and took care to obtain clauses which should protect the public against any injury. [His lordship referred to sections 160, 161, and 162.] The 162nd section imposes a penalty when there is notice; it uses the word "offence," not as equivalent to "crime," but as meaning "an offensive act"—the act complained of. The question is, whether the defendants are, under the circumstances, guilty of the mischief provided against by the Act, and therefore liable. It is distinctly found by the case that the cracking of the tank, and the flowing of the water through it, was the cause of the pollution. The crack took place on the 6th of July, and on the 7th plaintiff found his water was fouled. I think it was intended by the Act most strongly to tie up the company, and to give the public every possible security, by imposing a penalty on the company totally irrespective of their being personally in fault. It is unnecessary for us now to decide whether they are or are not, but I am by no means persuaded that they are not; they might have made inquiries and obtained some information, and they would then have taken better care, and placed their tank where it could not be injured by any workings. I believe a well is a place for water within the language of the 160th section, and therefore the plaintiff is entitled to judgment.

Baron MARTIN: I am of the same opinion. It is not necessary for me or for the court to give any opinion whether the defendants were guilty of negligence or not; if it were, I should decline to give an opinion on the case at all, because the facts are so stated that one member of the court might arrive at one conclusion, and another at another, and both be able to give very good grounds for their opinion. When the court is to draw inferences, the facts should be so stated as that all should arrive at the same conclusion. I would not mention this but that it seems to me there is by no means so clear a case of absence of negligence on the part of the company as was put by Sir F. Kelly. When the company are about to buy the land, they employ an engineer, who does not find out that the mines under half the land were worked out fourteen years before. It can hardly be said that a proper investigation was made. I must say that, if I were obliged to decide the question of negligence, it would be an element in my decision that in 1852 the company erected a tank on what they believed to be sound land, whereas more than half of it had been worked under, and the mines had been carried within a yard of the wall of the tank. I entirely agree with my lord as to the construction of the Act. The Act incorporates the company for their own private benefit, and there is a proviso that they may divide 10 per cent.; they require the authority of Parliament to establish works which it is well known are likely to produce injury, and the Legislature intended to protect the public against any consequence; it takes care there shall be no mistake, and uses clear and precise language to show that the company are to take on themselves the duty of absolutely preventing any injury. So far from this being unjust, I think it a most proper provision; the public ought to be protected from works done by persons for their own benefit. In this case, the word "offence" is used to mean whatever the Legislature intended should not be done by the company. The 162nd section puts the matter beyond all doubt: in addition to the penalty imposed by the 160th section, there is an additional one of £20 for each day that the evil continues after notice. The Legislature clearly intended the company should insure the public; if, notwithstanding all the care, an injury is done, they are liable to £200 penalty, whether they have notice or not; if after notice the evil is not remedied, they are liable to a further penalty of £20 a day.

Baron WATSON: I am entirely of the same opinion. The company was incorporated for its own benefit. The object of these sections was to preserve the purity of the water, and so far from being unjust the clauses are most proper for that object. The Legislature gave the company power to put their works where they pleased, but they took care wherever they were put that no injury should be done to the public. If the company were not made thus liable, what remedy would the plaintiff have? how could he tell whether the injury proceeded from the old or the new workings? who was he to bring his action against? To obviate all these inconveniences the Legislature make the company liable to every person who suffers any injury.

Judgment was therefore entered for the plaintiff on the first count.

SOUTHWARK POLICE COURT.

WEDNESDAY, JANUARY 25.

(*Before Mr.* COOMBE.)

CHARGE OF NUISANCE AGAINST THE SURREY CONSUMERS' GAS COMPANY.

Mr. DREW appeared for the Vestry, and Mr. CHILD, of the firm of Wire and Child, for the defendants.

Mr. G. H. DREW said he appeared on behalf of the vestry of the parish of Bermondsey to prefer a charge against the Surrey Consumers' Gas Company, under the Nuisances Removal Act, for that they, in the manufacture of gas

on their premises at Rotherhithe, did on or about the 16th instant, cause such a nuisance to exist as to be injurious to the health of the inhabitants of the parish. The vestry had felt it to be their duty to bring the matter before the police magistrate for settlement rather than incur the expense of prefering an indictment against the company. He thought that the bench would be of opinion that this was a case which came under the Act of Parliament to which he had referred when he pointed out that the company, who had powers and privileges given them to supply pure ordinary gas, had been for some time supplying gas in the district of so deleterious a character as to be, according to the certificate of the medical officer, most prejudicial and injurious to the health of the inhabitants. Several of the inhabitants were present, and would speak to the bad effects produced upon them; and he might also state that so offensive had the smell become on Sunday, that the churchwardens were obliged to shut up the parish church, to the great annoyance of the congregation.

Mr. COOMBE: Does the nuisance still exist?

Mr. CHILD: No, sir, it has been abated; it was entirely the result of an accident.

Mr. COOMBE: How long did it last?

Mr. CHILD: The accident occurred on the Saturday morning, and it was remedied on the following Monday.

Mr. COOMBE: Under what section of the Act do you proceed, Mr. Drew?

Mr. DREW: Under the Act 18 and 19 Vic. cap. 121, which is the Nuisances Removal Act.

Mr. CHILD: That does not deal with such a matter as this. It would be convenient to know under what section the vestry proceed.

Mr. DREW: The 27th section.

Mr. CHILD: Your worship will observe that that section does not define what is a nuisance.

Mr. DREW: It says, anything which is injurious to the health of the inhabitants.

Mr. COOMBE: It says that "if any manufactory, building, or place used for any trade, business, or manufacture causing effluvia, be at any time certified to the local authority by any medical officer, or any two legally qualified medical practitioners, to be a nuisance, or injurious to the health of the inhabitants of the neighbourhood, the local authority shall direct complaint to be made before any justices," &c.

Mr. CHILD: But it does not state what the nuisance is.

Mr. COOMBE: Perhaps it would be convenient to hear the evidence; but, if the nuisance does not exist any longer, I don't know that I need.

Mr. DREW: I am afraid it still exists.

Mr. COOMBE: Mr. Child's statement is that it was the result of an accident, which has since been remedied.

Mr. DREW said he had to ask the opinion of the magistrate whether it was not an accident which could have been prevented? and whether the company had used the best means in their power to guard against its recurrence? because otherwise it might happen again.

Mr. COOMBE: The second part of the 27th section states, "that if it shall appear to such justices that the trade or business carried on by the person complained against is a nuisance, or causes any effluvia injurious to the health of the inhabitants of the neighbourhood, and that such person shall not have used the best practicable means for abating such nuisance, or preventing or counteracting such effluvia, the person so offending shall, upon a summary conviction for such offence, forfeit and pay a sum of not more than £5, nor less than 40s," &c. Then it goes on to state—"Provided always that the justices may supend their final determination in any such case, upon condition that the person so complained against shall undertake to adopt, within a reasonable time, such means as the said justices shall judge to be practicable, and order to be carried into effect, for abating such nuisance, or mitigating or preventing the injurious effects of such effluvia;" so that it appears that it must be an existing nuisance at the time of taking out the summons, and not a nuisance arising from an accident which has been remedied. I could not make an order to prevent an accident. You are asking me to make an injunction to prevent an accident.

Mr. DREW: No, Sir; but we ask you to inquire what precautions they have taken to prevent the nuisance arising again.

Mr. CHILD: I can explain the whole of this matter to the satisfaction of the magistrate.

Mr. COOMBE: It seems to me that this clause applies to a nuisance existing, and not to one that has ceased before the day of hearing.

Mr. DREW: I have witnesses here to show that it still exists.

Mr. COOMBE: That will make a different complaint of it. You must show that the measures taken by the company to prevent the nuisance have not succeeded.

Mr. DREW: I am afraid that is the case.

Dr. *Challice*, examined by Mr. DREW.

On Monday morning, January 16th, my attention was first called to the state of the gas supplied by this company, in consequence of several written communications on the subject. I first went to the church of St. Mary Magdalen, which is about a mile and a half from the company's works. From thence I went to the rectory-house, where I found the gas was turned on. It was of a very offensive character, and the rector told me what effect the smell had produced upon himself and his family—but that is not evidence. I got some test-paper from a chemist's, and examined the gas at a shop opposite. On applying the test-paper, which was paper steeped in a solution of lead, it became black immediately, and showed the presence of what is commonly called sulphuretted hydrogen and sulphide of ammonia. This proved that the gas was unpurified, and most decidedly injurious to health. Every one in the street was complaining of headache, sore throat, and sickness. In was, in fact, so impure as to be dangerous to life. In the evening of that day the vestry held their meeting, and I reported upon the condition of the gas. In the vestry-room, where the same gas was being consumed, the atmosphere was irritating in the extreme. The physical effects were patent to every person present. The gas was most offensive; it blackened a silver spoon and a silver piece immediately. On leaving, I took a sample of the gas from a pipe in the workhouse. That was about nine o'clock in the evening, and the gas was then in the same state. In fact, the atmosphere was so bad that I advised them to use candles. On Tuesday morning I was anxious to ascertain the condition of the gas, and I went to the offices of the vestry in Maltby Street. I took one sample of gas from there, and left instructions with the inspector of police to take another. The sample I then took was not so bad as that of the day before.

Mr. COOMBE: Was it then of such a character as to be injurious to health?

Witness: Yes; it contained so great a quantity of impurity as to be very injurious to health.

Mr. CHILD: Can you tell us the per centage of impurity?

Witness: I did not take it, but you can have the evidence of Dr. Thomson on that point.

Mr. COOMBE: But you say it was "injurious to health." Those are the words of the Act of Parliament, and that is enough for me. Have you taken notice of the quality of the gas since then?

Witness: Personally I have not until this afternoon; but there have been a number of complaints.

Mr. CHILD: There is a general admission that the gas is much better.

Witness: At a quarter past one to-day I tried the gas of this company in the laboratory of St. Thomas's Hospital.

Mr. COOMBE: Is it admitted that that is the gas of this company?

Witness: Solely and exclusively; no other company can supply. There can be no question of evidence on that point. The gas, when tested, showed the presence of free ammonia to a very considerable and unusual extent. There was no indication of sulphuretted hydrogen being present—or very little, if any. In three cubic inches of gas there was sufficient ammonia to turn the red litmus-paper blue. The gas was not so dangerous to health as before, but I should think the quantity of ammonia was quite unprecedented—except on one occasion, two years ago.

Mr. COOMBE: That shows that the company have taken some precautions to prevent a repetition of the nuisance, if it is two years ago since the gas was as bad.

Mr. CHILD: It is more than two years ago, and that was the solitary instance in the history of the company.

Mr. COOMBE: Would the same accident which caused the presence of sulphuretted hydrogen account for the presence of ammonia?

Mr. CHILD: Yes, and I shall show you that the doctor's evidence proves the *bonâ fides* of my case.

Witness cross examined by Mr. CHILD: When I went to the rectory on Monday week the tests which I employed were blotting paper dipped in a solution of lead and washed silver coin; those tests would not detect the presence of ammonia in the gas, but I was conscious of the presence of it in enormous quantities. I have not made any examination of the gas myself since the 16th inst. until this morning. The gas I experimented upon at the hospital was taken from one of the burners there. I also examined the two samples taken on Tuesday, the 17th. Those samples were taken with great care, and to the best of my belief there was no possibility of their being mingled with other gas. In the gas taken at the hospital this morning there was only a trace of sulphur, but of ammonia there was a most surprising quantity.

Mr. CHILD: What do you mean by a surprising quantity?

Witness: Generally speaking, you expect to find only a trace of ammonia in such a small quantity of gas as two cubic inches. A gentleman who was present at this examination said he had never seen so large a proportion in his life. As a general rule, the test paper should be exposed for a considerable time before being influenced, but in this case it was changed instantaneously. I am not prepared to speak to the number of grains per cent.

By Mr. DREW: The quantity was undoubtedly sufficient to prove injurious to health.

Dr. *Robert Dundas Thomson*, examined by Mr. DREW.

I am lecturer on chemistry at St. Thomas's Hospital, and medical officer of health of St. Marylebone. On Tuesday or Wednesday week I found in my laboratory several samples of gas, which I was requested to examine for Dr. Challice. In one sample, which was contained in a small bladder, I detected the presence of sulphur in sufficient quantity as to be injurious to health. The same day the medical officer of St. John's and St. Olave's called on me and told me that the people in the neighbourhood were in great alarm as to the state of the gas. I accordingly examined the gas supplied to the burners in the laboratory of St. Thomas's Hospital. The result was, that I found a large quantity of sulphuretted hydrogen—sufficient, as I considered, to be injurious to health. The remaining samples of gas brought to me by Dr. Challice were examined this morning, and there was a small trace of sulphur present, but I cannot give an opinion as to whether it would be sufficient to be injurious. I tested the gas supplied to St. Thomas's Hospital to-day in a cursory way. I should tell you that when I discovered sulphur in that gas on the first occasion I communicated with the steward of the hospital, from whom I learned that complaints had been made of the smell.

Mr. CHILD objected to the witness speaking of what an absent person had told him.

Witness: The point I want to come to is to show the danger which would arise from the smallest leakage of such gas. When the gas is burned, the sulphur is consumed in that form; but if there is a slight leakage from the pipe, the sulphur in a poisonous state is mixed with the atmosphere. The steward found that there was a leakage, but I did not see it. When I tested the gas in the laboratory to-day, I found ammonia in it. I did not determine the quantity, but I considered that there was much more than ought to exist in it.

Mr. COOMBE: There is ammonia in all gas?

Witness: Very frequently there is, but there ought not to be.

Mr. COOMBE: Can that be avoided by any process in the course of the manufacture?

Witness: Certainly it can.

Mr. COOMBE: Does its presence arise from any imperfection in the process?

Witness: Yes, from an imperfection in the process. Of course that is my medical opinion.

Mr. DREW: You are acquainted with the process of manufacturing gas. Is it possible to prevent such an accident as is supposed to have caused this nuisance?

Mr. CHILD: You have not heard what the accident is yet.

Mr. DREW: Is it possible to prevent the escape of unpurified gas in this way?

Witness: It is, and the public ought to be ensured against the possibility of its occurrence.

Mr. DREW: By what means can it be prevented?

Witness: That is a detail of manufacture which it would be a tedious business to go through. The gas is purified by being passed through certain purifiers, and if they are sufficiently numerous and efficient, the impurities would be entirely removed.

By Mr. CHILD: I did not detect any sulphur in the gas tested this morning.

Mr. *Thomas P. Slee*, examined by Mr. DREW.

I am an inhabitant of Bermondsey, and a large consumer of the gas supplied by this company.

Mr. DREW: State what you noticed in respect to the gas on or about the 16th.

Mr. CHILD: I think I can relieve my friend on this point. We will admit the fact of the gas being impure.

Mr. COOMBE: You admit the fact, but you say it was the result of an accident?

Mr. CHILD: That is so, Sir; and we remedied it as soon as possible.

Mr. COOMBE: But Dr. Challice says it is nearly as bad this morning.

Mr. CHILD: I shall satisfy you, Sir, that it is not so.

Mr. DREW: I will only ask Mr. Slee one question—How long have you noticed this?

Witness: A considerable time—for months together, at times, I have noticed a peculiarly offensive sulphurous smell, but not so bad as it was on Tuesday week.

Mr. CHILD: I am not admitting this, of course.

Witness: On Saturday week I went into my factory, and the engineer said to me—"Our drains smell very bad." I noticed a most suffocating smell, which affected me so badly that I was obliged to go out into the air. It came from the gas burner in the factory. That was about seven o'clock in the morning; but it continued all day, and in the evening was, if anything, worse. It was so bad on Sunday that we were compelled to turn the gas off in my house, and burn candles. This state of things continued all day on Monday, and until eleven o'clock on Tuesday, which was the last time I smelled anything of it. Last Monday, however, it was very bad for about half an hour. I believe that arose from our using burners which had not been lighted since the previous time.

Mr. CHILD: That was some of the old gas.

Witness: I thought it only right to state that.

By Mr. DREW: Before last Saturday week I had perceived a sulphurous smell, but not sufficient to be disagreeable; but on the 18th and 19th it was frightful.

Mr. *Edward Smith:* I am a tailor and draper, residing at Dockhead. I am supplied with gas from this company, and for the last three months I have experienced ill effects from the bad quality of it.

Mr. CHILD: That is not in issue. The summons is for a nuisance "on or about the 16th of January."

Mr. DREW submitted that, as the magistrate would have to determine whether, in the language of the Act, "the trade or business carried on by the person complained against is a nuisance," the evidence of this witness would go to prove that.

Mr. COOMBE: That is not in the summons. The company are only summoned for an offence "on or about the 16th of January."

Mr. DREW: But then you may go into evidence to satisfy you whether before or after that there was such a nuisance caused by this manufacture as to be injurious to health.

Mr. COOMBE: I think you should have given them notice if you intended to go into that, so that they might have come prepared to answer it. Otherwise, you might go back for months or years.

Mr. DREW: I submit that, according to this section, if the trade is proved to be a nuisance, you can convict them on this complaint.

Mr. CHILD: The complaint in the summons.

Mr. COOMBE: It must be on or about the time specified. If Mr. Child objects I cannot go into what took place months ago. You must confine yourself to the time mentioned in the summons.

Mr. DREW: Then I will only ask the witness, as he is anxious to give evidence, as to the effect of the smell upon his child on Saturday week.

Witness: My child has been suffering from a chest disease, and is now on the point of death. The doctor attributes it to nothing more than the effects of this gas. He does not decidedly say so, but he says he has no doubt it has brought it on.

Mr. COOMBE: The doctor should be here himself. You only go by what the doctor says; if he were here, he might, on cross-examination, find out some other cause.

The CLERK: Was the child well before?

Witness: It was not ill with that complaint.

Mr. COOMBE: The doctor seems to have some doubt; but we cannot go into this.

Mr. DREW: It only goes to show that at that time the gas was very bad.

Mr. COOMBE: They admit the fact, but they say that an accident occurred on those days, and the result was to make the gas impure. On Dr. Challice's evidence it is quite clear that the gas was extremely injurious.

Witness: If it had lasted two days longer it would have poisoned the whole neighbourhood.

Mr. DREW: That, Sir, is our case. I submit that the manufacture carried on by the company has been proved to be a nuisance and injurious to health, and unless they can prove that they have taken such remedial measures as will prevent the repetition of the nuisance—"the best practicable means"—they come within the penalty of the Act of Parliament.

Mr. CHILD said he was instructed on the part of the defendants in this case, and, as it appeared to him, their defence was an extremely simple one—viz., that the nuisance complained of was the result of an accident. He would briefly explain the nature of that accident, and show what was done by the company immediately on its discovery to remedy the evil. He would prove that they adopted the most energetic means to prevent the nuisance, and that those means had been attended with success. He was afraid that the strong feeling existing in the parish in reference to the supply of gas had had something to do with the complaint, but he was quite sure it would not be allowed to have any influence in reference to the decision upon it. The complaint in the summons was limited to a nuisance on the 16th of January, and in regard to that nuisance the facts were these. The diagram which he would hand up to the bench would enable the magistrate to see what was the arrangement made for the purification of the gas supplied by the company. It would be understood that the impure gas passed through the several purifiers there exhibited, until, being freed in its passage from deleterious ingredients, it arrived at the main and was distributed for consumption. These purifiers were supplied with valves to shut out the bad gas from the main, and to permit the purified gas only to pass away to be burned. Those valves were, of course, of the utmost importance, and on their exactness of operation in shutting off the unpurified gas every thing depended. In reference to one of them, it appeared that on Saturday morning, the 14th of January, about two o'clock, the man in charge discovered that the worm of the screw which actuated it had ceased to work, in consequence of having become worn out. The effect produced was that the valve ceased to act, and the impure gas escaped into the main and was distributing itself over the district generally. He instantly aroused the manager of the works, and informed him of it. Such measures as were within the manager's power at the moment were applied; but, in order to effectually remedy the evil, the valve and screw had to be removed and replaced by new ones. This was not the work of a moment, as such materials were not to be found at ordinary brass-founders. The accident, however, was entirely remedied by nine o'clock on the following Monday morning, and the machinery put perfectly to rights again. As to the effect of the accident there could be no question that, between the Saturday and Monday, impure gas was distributed over the district. No doubt, also, it was of a highly injurious character, and, if used in general consumption, would be exceedingly prejudicial to health. The impure gas being distributed over the neighbourhood would continue to produce unpleasant effects for some time after the accident was repaired, and it might be ten days or a fortnight before they were entirely got rid of.

Mr. COOMBE: Do you know how long this purifier had been out of order?

Mr. CHILD said it was not known to be out of order. The failure of the screw was the work of a moment, and could not be foreseen. It was like the breaking down of a dam. So long as the screw answered the valve was fixed, and operated properly; the instant the screw failed the impure gas passed through. There were no means of preventing the evils which ensued, for the gas was distributed all over the district. The company had sixty miles of pipes, and Mr. Warington, who would be called as a witness, would satisfy the bench that it would take days to remove the effects, even after the accident itself had been remedied. That was the statement of the company's case, and he submitted that it was an answer to the charge in the summons.

Mr. COOMBE: Some of that gas may still be in the pipes, especially where the burners have not been used since?

Mr. CHILD said that really was the fact; but if he succeeded in satisfying the bench that the nuisance complained of was the result of an unavoidable accident, he should at once dispose of the summons. But if there should be any doubt upon the mind of his worship, he should respectfully submit that this was not a case within the meaning of the Act under which the information was laid. It would be found that the 8th section of the Nuisances Removal Act gave a special definition of the kind of nuisance over which the magistrate had control. The words of the section were—"The word 'nuisances' under this Act shall include any premises in such a state as to be a nuisance or injurious to health; any pool, ditch, gutter, watercourse, privy, urinal, cesspool, drain, or ashpit so foul as to be a nuisance or injurious to health; any accumulation or deposit which is a nuisance or injurious to health, &c." He submitted that the case now before the court did not come within the meaning of any portion of that definition. His friend (Mr. Drew) had quoted the 27th section; but he (Mr. Child) submitted that his case was as strong under that section as under the 8th, because the magistrate had jurisdiction only in the event of the person complained against not having used "the best practicable means for abating such nuisance or preventing or counteracting such effluvia, &c." Now, admitting that this was a nuisance within the meaning of the Act, which he contended it was not, he believed that he was in a position to show that the company had taken "the best practicable means" to abate it. Under these circumstances, therefore, they were entitled to be discharged from the present complaint.

Mr. COOMBE: The 8th clause of the Act, which explains what are deemed nuisances under this Act, seems to me to be quite inconsistent with the description of a nuisance as created by the 27th clause.

Mr. CHILD: I have thought so for a long time.

Mr. COOMBE: It may be applicable to other parts of the Act, but I do not think it is any explanation of the 27th section. It is very badly done, decidedly, because one would suppose it was intended to apply to everything in the Act; but, when you come to look at the 27th section, it is wholly inconsistent. I think, however, I am entitled to call upon you to show that you have done every thing you can to remedy the evil complained of.

Mr. CHILD: Saving my right to argue that this is not an offence within the meaning of the Act, I will proceed to call my witnesses.

Mr. COOMBE: I suppose you have no desire to avail yourself of the 28th section, by which there is a reference to the superior courts at the option of the party complained against.

Mr. CHILD: Oh, no; we shall be perfectly satisfied with your decision.

Mr. *David Hunter*, jun., examined by Mr. CHILD.

I am the manager of the Surrey Consumers' Gas Company, and reside at the works. On the morning of Saturday, the 14th, between two and three o'clock, the foreman of the purifiers came to me and told me that the gas was foul. I went directly to the purifiers, and, on examining the valve of No. 4 purifier, I found the screw was stripped, and that the valve would not shut off the foul gas. I then took means to shut off that purifier completely.

By Mr. COOMBE: The valve had not been long in that state—only some few minutes, since the man had been to call me out of the house—ten minutes at the outside. If it were not for the use of purifiers we could not supply gas for consumption.

By Mr. CHILD: We took the best means in our power to keep the gas clean. When daylight came the oxide was taken out, and we found the gas so strong that the men could not stand it, and one or two were made ill. The men had put the cover down, and tried to stop the nuisance with water. Notwithstanding all our endeavours, we could not prevent it. I sent to the engineer's for a new screw, but could not get it made until Monday morning, although their men worked all that day and Sunday. I received the new screw at a quarter past six on Monday morning, and it was fixed and worked by a quarter before nine o'clock. The works are now in a perfect state, as far as I know.

By Mr. COOMBE: I have never known of a similar accident occurring. These purifiers have been in existence four years, and we never before had an accident with them. It may probably never happen again for years. The cause of it appears to have been that, instead of having a wrought-iron nut, it was a gun-metal one. We have put a wrought-iron nut to it now, and the other purifiers have the same kind; I have examined every one of them. The screw that was made of gun-metal was corroded with the gas. I test the gas at the works every hour of the day, and the foreman does it at night, for the purpose of detecting the presence of sulphuretted hydrogen and ammonia, if there is any; or, in other words, whether the purification is complete. We never have allowed any impure gas to pass except on the occasion of this valve being out of order. Whenever we detect sulphuretted hydrogen we change it into another purifier, supposing that the one through which it is passing is not sufficiently active.

By Mr. CHILD: The state of the gas since we repaired the purifier has been good. There has been a small trace of ammonia; but we always allow a small quantity, which we do not find injurious. Some people think it improves the gas.

Cross-examined by Mr. DREW: The wrought-iron screws are not corroded by the gas. We could not see that this screw was corroded. It is enclosed in an iron box. We should not find it impossible to get it out, but the leakage of the gas would be great. There are four purifiers, and each of them have the same kind of screws. Three out of the four purifiers were at work at the time. The foul purifier was supposed to be shut off, but the screw being bad, the foul gas passed through it into the main, and

spoiled all the gas in it. If we had had another purifier, we might have put it on; but still the foul gas would have passed, because the valve was leaky. It is impossible to get a new valve at a moment's notice.

Mr. COOMBE: It is hardly likely they would have another purifier ready, when such an accident has not happened for four years. What is the size of the purifiers?

Witness: Twenty feet square, and the valves are 14 inches in diameter; they are all equal in size.

Mr. COOMBE: Of course they cannot be moved without a strong instrument.

Mr. CHILD: It requires a very powerful lever.

Mr. COOMBE: How long, in your judgment, would it take, if the gas was made foul, to get it purified again?

Witness: Eight or ten days.

By Mr. DREW: We could not stop the gas from passing all at once. On Sunday morning was the earliest time. The screw is 1½ inch in diameter. We could not have prevented the accident if we had had twenty spare purifiers. If we had broken off the connexion at the bottom, we should have stopped the supply of gas altogether. We could not have done anything else than what we did. I have been connected with gas-works all my life. I have been in the Phœnix Company and the Imperial. I cannot say that the Phœnix have an arrangement by which such an accident as this could not arise. If they use the same kind of valves, they would be liable to the same kind of accident. I cannot recollect whether they do or not. If the foul gas had been in the last purifier of the series, it might have been broken off from the main; but it is in the centre; so that if we had done so, it would not have prevented the nuisance.

Mr. COOMBE: It seems to me, Mr. Child, that you have answered the case. You need not call any other witnesses.

Mr. CHILD: Perhaps, Sir, you will hear Mr. Warington?

Mr. COMBE: Do you think it worth while? Dr. Challice, do you wish to hear him?

Dr. CHALLICE: No.

Mr. CHILD: I will tender Mr. Warington, and then my friend can do as he likes.

Mr. COMBE: What is Mr. Warington?

Mr. *Warington:* I am chemical operator to the Society of Apothecaries.

Mr. DREW: I thought perhaps he was a gas engineer.

Mr. *Warington:* I am appointed to examine the gas of the four Surrey companies.

Mr. COOMBE: You have heard the evidence of the last witness; do you agree with him that the screw getting wrong was the cause of the foul gas?

Witness: I am perfectly convinced that it was.

Mr. COOMBE: Do you agree with him that the course adopted was the only practicable mode of remedying the evil?

Witness: I am not acquainted with the plant of a gas-work, but I should imagine they would take the most practicable means.

Mr. COOMBE: The summons is dismissed. It must be satisfactory to the inhabitants to know, if the evidence of Mr. Hunter is to be relied upon, that there is no probability of such an accident occurring again.

Alderman WIRE (one of the directors of the company, who had occupied a seat on the bench during the inquiry) said: I can assure you, Sir, on the part of the directors, that they have been extremely anxious to remedy the evil, and have adopted every means in their power for the purpose, as well as to prevent its recurrence. There is, I need not say, a strong feeling in the parish against the company.

Mr. COOMBE: I think we need not go into that. I believe that the authorities who have laid this information were quite right.

Alderman WIRE: We do not blame them.

Mr. COOMBE: As official men, they were quite right to have this investigation; and it must be satisfactory to the inhabitants to know that there is no chance of the nuisance arising again.

Miscellaneous News.

OBSERVATIONS ON AN IMPROVED OXYHYDROGEN LIME LIGHT.

By A. H. RENTON, C.E.

There is not a more important subject, nor one more affecting the comfort and convenience of society, than artificial light. Whether viewed as applied to the ordinary domestic services, to the more extended conveniences and requirements of every-day life, or to the many purposes in the arts to which it has now become an indispensable adjunct, artificial light must be regarded as so administering to the necessities of our existence, that it is of paramount importance to the public; and any improvement in its character or economy will claim to be hailed as a public boon: economy in many cases, though not as a rule, more especially conducing to its universal adoption.

So many circumstances have arisen in various departments of the arts, where either a powerful light is indispensable at any cost, or where economy is of the highest importance, that to combine these two elements successfully is a desideratum.

It is interesting to trace the progress of artificial lighting, from the primitive reed of the swamps or the pine torch of the wilderness, to the comparatively elegant and brilliant wax candle of the modern drawing room, or from the rude tallow urn or oil lamp of the ancients, to its more diffused successor, the gas-light of modern days. Even this latter, brilliant as it is in any shape by comparison with its predecessors, has, from its earliest introduction to the present time, passed through many and varied phases of excellence before arriving at its present state of perfection.

Viewing artificial light in its every-day practical bearing, which is, after all, the only view of it calculated to interest the public, gas was doubtless the most substantial improvement of modern times, and has led to a complete regeneration of our social system.

By the introduction of gas into our streets and shops, a wholesome revolution has been effected alike in the comfort of passengers and purchasers; and crime, if not actually lessened by it, has been brought within the more complete control of the agents of the law.

It has contributed much to the convenience and elegance of our mansions, from its cleanliness and power, combining with those desiderata a very considerable degree of economy, the value of which has been illustrated by its effects.

If any EVIDENCE were wanting to confirm the necessity for still further advances in the production of an economical and powerful light, it is only necessary to point to the many costly attempts which have from time to time been made, at the expense of many thousands of pounds, to achieve something in the shape of a new light, *as far surpassing gas* as gas has already surpassed all its predecessors.

Great and rapid have been the improvements of late years in our domestic lights, the requisites for which, as essential elements of their character, are economy, simplicity, cleanliness, safety, and power combined; and many very beautiful contrivances, with a view to this end, have resulted in the production of wax, sperm, stearine, and Palmer candles; the argand, carcel, solar, camphine, and other lamps, ingeniously devised to attain one great object, viz., economy and power, have, with varied success, met with the well-merited support of the public.

In many large mansions the aristocratic wax candle still holds its sway, though at great cost, and is superseded by gas only in exceptional cases; while for the more extensive applications of light to public buildings, shops, and external lighting, gas has been the only alternative, and even in our smaller towns has supplanted the modest oil lamps, which scarcely sufficed to do more than to render the darkness visible.

As great a change has been effected in the lighting of our streets as in the substitution of the well-organized police for the ancient venal sexagenerian guardians of the night, which with the rising generation are myths or *res incognitæ*. There is no doubt of the fact, that where light is abundant, crime will less abound, as it invariably shuns the light, because its deeds are evil.

The electric light, which, from its great intensity, was supposed to possess all the requisites for lighting purposes, has for some years past engrossed the attention of capitalits and others, who have expended large sums of money in vain attempts to render it the *ne plus ultra* of lights. But in spite of the great pains, labour, and money bestowed upon it, it has failed to realize the sanguine anticipations formed of it, as it possesses neither volume nor continuity, and is a very extravagant mode of obtaining the object in view. The trouble and uncertainty attending the use of the battery for generating the electricity, and the consequent effect upon the simple and vivid speck of light, renders it, from its inconstancy, unfit for the general purposes of lighting.*

As far as the problem of the continuity of the electric fluid is concerned, it has been successfully solved by the employment of magneto-electricity, but still leaving the indispensable elements of perfect continuity, sufficiency of volume, and economy unsolved. Hence it is hopeless to look to the electric light as an effective agent for illumination, as it is deficient in those qualities without which it is impossible to produce an efficient light.

A light of great brilliancy was some years ago produced by combining a large volume of oxygen gas with a congeries of argand, or other burners, supplied with oil, and known as the bude light, but, like others, was finally rejected, as disadvantageous in practice.†

For many years, even as far back as 1820, attempts were made to obtain a safe and intense light by the ignition or combustion of a ball of lime, in the united flames of hydrogen and oxygen gases. It was employed for microscopic purposes, and is stated to be equal to about 264 flames of an ordinary argand lamp (consuming the best spermaceti oil), each of which is equivalent to ten wax candles of four to the pound.‡

About the year 1826, Lieutenant Drummond, who was appointed to conduct the ordnance survey in Ireland and Scotland, first applied the lime light, in the focus of a paraboloid, on lofty eminences, where the stations were usually placed, as it was of great importance in those operations to have certain and determinate signals, which could, almost under any circumstances of the weather, be seen at great distances; and by it he successfully connected the opposite shores of Ireland and England at or about Holyhead, a distance of about 64 *miles*. He used, on some of those occasions, oxygen gas and alcoholic vapour, but ultimately substituted hydrogen gas for the latter. In Scotland he obtained a most successful result on the summits of Ben Lomond and Knock Layd, a distance of 95 *miles*, thus demonstrating the practicability of adopting the lime light for long distances.§

But even Drummond's comprehensive mind failed to overcome the chief obstacles to its introduction as a perfect lighthouse light, although many valuable experiments upon it were made and exhibited publicly by him, and he is therefore entitled to great credit for his persevering pursuit of the subject, and for having thus pioneered the way for subsequent efforts to perfect it. As Drummond left it, its want of volume was one of its main objections, and its want of continuity was fatal to its employment for the purposes of steady and permanent lighting.

It was not, however, until after many and repeated failures to produce a permanent light from electricity that the lime light was revived, and received a considerable share of attention from various persons, who, each contributing more or less important steps, advanced its progress with varied success. During the last 30 years this light has been employed for illuminating the microscope used for the exhibition of dissolving views, &c. Amongst other applications, it has been used for upwards of 20 years in the theatres of the Royal Polytechnic Institution for their beautiful exhibitions.

In adapting the light to their requirements, a most valuable series

* *See* Stevenson on Lighthouses, p. 65.

† Idem, p. 66.

‡ Idem, p. 65.

§ Drummond on Light, Phil. Trans. for 1826, p. 324; and 1830, p. 383.

of experiments were made at that institution, the results of which are herein given at length, by which the comparative power and value of the various known modes of producing artifical light is rendered clearly apparent. These results accord most accurately with those I have personally made, and show that the oxyhydrogen lime light is considerably cheaper than the cheapest of all other lights, viz., coal gas; and bearing a most extraordinary relation to oil lamps and wax candles, which latter are generally used as a standard of comparison.

In the application of the lime light to the microscope and similar exhibitions, as well as to the blowpipe, there was no necessity for its continuance beyond the ordinary duration of a lecture, and therefore the objections which were fatal to the light when applied to the many purposes of illumination did not apply; since, with them, permanence for a lengthened period was scarcely, if ever, required. But, as a continual change in the surface of the lime is indispensable under any circumstances, in order to insure a regular and continuous light, sufficient steadiness may be obtained for a short period by very simple mechanical means, by which either a simple or spiral rotation is imparted to the disc or cylinder of lime upon which the flame impinges.

But the extensive and important applications of the lime light proposed by the Lime Light Company, entailed the necessity for providing for *many consecutive hours'* duration of the light with *unvarying intensity*, and it was therefore imperative to devise a remedy for those defects which had hitherto prevented the successful adoption of the lime light; and they determined to avail themselves of Bastable's patented improvements, as fulfilling the required conditions, of which they had satisfied themselves by a course of numerous and rigorous tests.

Before describing these improvements it may be well to refer to the elements of a lime light, and the modes of producing them.

It was found by Drummond that many substances were capable of producing light in conjunction with gases, but, that of all those which were available for the perfect combustion of the gases, chalk lime was the most suitable material for the purpose, and hence the name of "Lime Light." It was also the cheapest and most easily attainable in any locality. It was likewise found that several gases, compounds of hydrogen, might be successfully employed in combination with oxygen gas, as well as pure hydrogen.

Pure hydrogen gas obtained from zinc, and diluted sulphuric acid, offers facilities in cases where carburetted hydrogen, as supplied by the gas-works, cannot be readily procured, but coal gas, where available, is a most desirable substitute for the ordinary applications of the light.

The product resulting from the generation of pure hydrogen gas from zinc and sulphuric acid, is sulphate of zinc, which, from the extensive demand for it, as a material used in the manufacture of paint, &c., will always find a ready sale at a price which will leave the cost of the gas in favourable contrast with other gases which may be used for the purpose.

In the year 1835, Mr. A. Gordon, C.E., patented a very ingenious and elegant process for generating hydrogen gas from zinc and sulphuric acid, which consisted in attaching the zinc to the rising portion of the gasholder, so that when it was fully charged, the zinc (which had, during the generation of the gas, been immersed in the diluted acid, moving upward with it), emerged from the liquid, and consequently suspended the formation of gas, until by the consumption of the contained gas, the gasholder descended, by which the zinc became again immersed in the diluted acid, and the formation of gas was resumed. It therefore became a complete regulator of the generating process, and insured the utmost economy in the production of the gas. It is obvious that, by this arrangement, the average or continuous generation of gas will be precisely equal to the demand, and not intermittent, as the elements employed will be supplied only in the required quantities, but continuously.

Where it would be necessary to employ oil gas, in localities where coal gas is not available, a device similar to that which has been described for hydrogen has been successfully employed, the regulation for the supply of the oil to the retort being controlled by the ascent and descent of the gasholder.

The use of Leslie's coal gas liquid offers a simple means of procuring this gas cheaply, as it is stated that its cost will be much less than that of ordinary coal gas.

The generation of oxygen gas, which plays so important a part in the production of this light, is one of extreme simplicity. It is obtained cheaply and easily from a variety of substances, each existing in great abundance, viz.: peroxide of manganese (black oxide), chlorate of potassa, nitrate of potassa (familiarly known as saltpetre). Several other substances, the employment of which for this purpose is, however, precluded by their cost, as oxide of lead and red oxide of mercury; but it is improbable that these, as the other substances, will yield a residuum, which may become an article of ready and remunerative sale, in which case the cost of the gas produced from them will be reduced to a mere nominal value.

The peroxide of manganese requires simply to be placed in a retort raised to a red heat, when the oxygen gas is freely disengaged. So soon as the gas ceases to be evolved from the manganese (which can only be effected practically to the extent of about 11 per cent., although it contains at times 80 per cent.), the residum, the deutoxide, or sesquioxide of manganese, may be drawn from the retort; and if thrown into water, or exposed at a high temperature to the action of the atmosphere, it will attract oxygen with great avidity, and thus this refuse becomes revivified, or resumes its former state of a peroxide, fitting it by this operation for a repetition of the distillatory process.

This peculiar property of the deutoxide of manganese (of rapidly absorbing oxygen from the surrounding air or other oxygenated bodies brought into contact with it) gives to this substance a great commercial value as a material for producing oxygen gas; for since the actual consumption of the manganese is thus limited by the quantity necessary to provide for the supply of gas during the time required for the revivification of the exhausted material, a comparatively small stock only will be needed to compensate for the unavoidable waste consequent on this mode of operating upon it.

In addition to this source of economy, the demand for the deutoxide of manganese for chemical purposes in glass-making, bleaching, and other processes in the arts, presents a means by which the residuum may be disposed of at a price which will leave the cost of the gas merely nominal. Thousands of tons are imported annually into this country, from the continent, for the before-named purposes, and hence the disposal of the residuum is a matter of certainty.

The chlorate of potassa is a substance which, though costly at first hand, is nevertheless a valuable material for the production of oxygen gas, from the facility which it affords to the operator. The comparatively low temperature required for its disengagement, and the rapidity with which it is produced, requires less attention and labour. Hence the cost of the gas is not so great as would at first sight appear, when contrasted with that from manganese. The residuum is chloride of potassium, or familiarly, muriate of potash, and is used in the arts.

The cost of the lime will, under proper arrangements, be extremely small, and may be next considered. Lime, being an article of such general consumption, and so readily procurable in almost any locality, and also from its being produced at a low cost, is scarcely worth estimating as an element in the cost of maintaining the light. The pieces of lime, which require to be shaped by proper tools to the desired forms, being the work of boys at a low rate of wages, may be produced at a cheap rate; or as about 1½ inches is requisite for each hour's consumption, the cost per hour for each jet may be taken at ·03 of a penny. This value will be convenient for inserting in the cost of the light, when its maintainance is considered.

Having thus shown the modes of obtaining the elements of the light, it now only remains to describe the improved form of the instrument in which they are utilized, with some of the many important applications which are contemplated by the Lime Light Company.

A patent was taken out in this country in the year 1858, for "Improvements in apparatus employed in the production of light," by Mr. J. H. Bastable (a communication); and subsequently a patent for additional improvements has been obtained in the year 1859 by Mr. Prosser.

The object of these patents is to remedy the defects of the former applications of the lime light. It has been invariably found, that although for short periods, for microscopes, and similar comparatively minor applications of the light, the adopted methods of applying the lime were with great care sufficient for the purpose, yet for the general purpose of lighting, the means were totally inadequate to the object; as the lime, when exposed to the action of the heat produced by the combustion of the gases, or the influence of the atmosphere, unavoidably became cracked or decrepitated, and in this ruptured state, having no support, fell away from the jet of flame, and either rendered the light inconstant or entirely useless; for the ignited gases, without the presence of the lime, possess no illuminating power whatsoever, though they are in that state most powerful agents for the destructive separation of refractory substances.

To effect the desired object of protecting the lime from crumbling away, and of insuring a practically unlimited supply, the simple expedient of enclosing the lime in a case or guard, both above and below the point of ignition, was resorted to, exposing only such a portion of its surface as was required for the action of the gases; and by giving to the lime so enclosed a movement within the tube, the retention of the ruptured portions of the lime was insured, until by simple means they were allowed to escape without detriment to the light, or were replaced by a fresh supply in as simple a manner as the cotton wick of an argand lamp, thus effecting with the perfect continuity of the light for any reasonable period (*a fortnight or more if necessary*) of time, the maximum brilliancy of the light.

So simple are the mechanical appliances for producing these results, that they fall as much within the compass of the ordinary attention bestowed on such objects as that required for an ordinary lamp.

The extreme purity of the light eminently adapts it for interior illumination, as there is no evolution of deleterious gases or fumes (which from gas are so destructive to works of art, as pictures, furniture, and costly embellishments); nor any abstraction of the oxygen from the atmosphere, the requisite quantity for combustion being supplied by the instrument itself.

The light can be used either as a naked light, or in combination with the catoptric, dioptric, or the catadioptric systems, for lighthouses and ships of every class; for railway stations and signals, both fixed and moveable; for floating light vessels or buoys in navigable channels; for bridges, wharfs, public buildings, factories, squares, and large and important thoroughfares; and by a judicious and compact arrangement of apparatus, its introduction into the interior of mansions where gas has not hitherto found access will doubtless be insured. The application to street lighting, from its extensive and important character, had been reserved for the serious consideration of the company, who have, however, so far matured their plans as to justify their anticipations of complete success.

Amongst other applications of the lime light, it is from its portability eminently adapted for *military operations in the field*, both in the attack and defence of important positions. It is not less important as an adjunct to the *Coast Guard Service*, both as an element of protection against aggressive surprise, and as a valuable addition to the already extensive arrangements for the safety of human life and

property. And when, as at the present time, the protection of the coast is looked to as a grave matter for consideration as well as anxiety, and even of vital importance to the country, it will be found to be a matter in which the security of the coast is concerned. The light has been rendered so portable by the employment of *compressed gases*,* that a coast guardsman can carry his charged lantern in his belt in the same manner as in the police force, the apparatus containing the supply of the gases being secured behind him as a knapsack. The lamp may be fitted with a shade to mask the light when it is not expedient to display it.

This form of the apparatus will be found convenient for reconnoitering parties, and for giving a full view even in the darkest night of the movements or positions of an enemy. For the more extended applications of the light to military purposes it is proposed to place it, with its feeding apparatus, on a gun carriage, the gas generators, if required to accompany the lamp, being carried on the fore-carriage; the propriety of using the light in that form being an arrangement well understood by the service to which it would be attached.

In India, where night marches are indispensable, this form of light would be admirably adapted to the wants of the army, and be deemed a great boon; as troops are not unfrequently obliged to wend their way by the light of a few flambeaux, which are but a poor apology for what is so much needed for their security and comfort.

There are many applications of the light, where it is important that the gases should occupy the smallest possible space: in such cases it will be necessary to reduce their volume by compressing them, with suitable machinery, into strong vessels, under a force of several atmospheres, from which they may be used at any desired pressure by means of a simple self-acting regulator, which permits the gas to flow to the light in a uniform and constant stream without the necessity of personal attention. It is not, however, advisable to resort to this arrangement of apparatus, except in cases of necessity; such as, some lighthouses, buoys afloat, portable railway signals, table lamps and moveable lights to be carried about the person, as in mines, for the coast, patrole and military operations, as the cost of the gases is increased from the necessity for mechanical manipulation to charge the gasholders. It is, however, indispensable for the purposes enumerated, and is under the most complete control.

A not less important application of the lime light is for the service of mines, whereby the safety of the miner from the effects of an explosion would be effectually secured, as the light may be enclosed, and protected from immediate contact with the surrounding atmosphere; for, unlike all other lights, it carries with it its own supply of oxygen gas, by which the combustion is maintained, instead of being forced to extract it from the air surrounding it. Hence there is no necessity for any direct communication with the atmosphere of the mine, and therefore the mixture and ignition of dangerous gases is effectually prevented.

In adapting the lime light to the purposes of lighthouses, beacons, fairway buoys, shipping and railway signals, the military and coast guard service, the great penetrating power of the light, which is one of its peculiar features, must not be lost sight of, as being invaluable in hazy or foggy weather, when the ability to discern signal lights at even a small distance is of incalculable advantage when ordinary lights are utterly useless.

The advantage of a light which should combine with steadiness, continuity, and diffusiveness, purity, economy, and simplicity, as well as the capability of being managed with ordinary attention, has been universally acknowledged, such features rendering it an object of national importance, and, therefore, having a claim upon the support of the public.

The qualities above enumerated are pre-eminently combined in the proposed lime light, giving it an intrinsic value which no other light possesses, even could it be obtained at a great cost.

A single jet is found to vary in power in a much higher ratio than that of the consumption of the gases.

In a jet of medium size, say 1-20th of an inch in diameter, the power is equivalent to 40 argand, or 80 fishtail gas-burners, each consuming 5 cubic feet of gas per hour, or to 400 wax candles, of 4 to the pound, consuming from 1 inch to 1·2 inch per hour. But the power is limited only by the quantity of gas and lime consumed; and while its power can be indefinitely increased, it is so completely under control that it can be regulated with the same facility that ordinary gas admits of. The continuity of the light is rendered certain by *the protection of the lime*, and its economy is insured by the small quantity of gas and lime required for its consumption. Any number of jets may be combined to form one lamp, and thus any desired power given to it, at the same time that the independent adjustment of each jet is provided for, so that the perfect combustion of the whole is effected.

When it is understood that so large a sum as £353,000 is annually expended on the coast lighthouses of the United Kingdom (as per return made in 1856, and laid before the House of Commons by Lord Clarence Paget, in April, 1858), and that of that sum no less than £208,000 was expended for maintainance alone, the necessity for adopting the most perfect light is obvious; since the cost of the simple elements of the light is trifling compared with the whole expense, which includes every incidental charge. And when it is further considered that for the same expense a lime light (equally manageable with the ordinary oil system), and of at least *eight* times the intensity and power, can be supplied at the same cost, being at the same time free from many of the practical objections of the present mode of lighting, there cannot be a doubt of its desirability. The necessity for a superabundant supply of oil to the wicks, to prevent them from charring; the necessity for constant attention to the wicks, reflectors and glasses; the constant attention to ventilation and supply of air for perfect combustion; the avoiding of gusts of wind through the air channels, and other minor attentions requisite to insure a constant and perfect light, as far as the system admits of, is by the employment of the lime light nearly, if not wholly, got rid of; so that the labours of the lighthouse attendants would be greatly diminished, and the service thereby better appointed, as depending less on personal attention. The same in all climates, there are no elements in the lime light which would be affected by alternations of temperature, while the steadiness and constancy of the light is insured against the casualties of gusts of wind, &c., which seriously affect ordinary lights.

The following interesting tabular statement of the comparative value of light from various substances is compiled from data derived from a valuable series of experiments, made at considerable cost of time and labour, by Professor Gardner (and attested by R. Longbottom, Esq., managing director), at the Royal Polytechnic Institution in Regent Street, London, and courteously permitted by him to be inserted herein. So useful as well as valuable a document will be appreciated by all who are intercsted in the subject of lighting:—

1. Description of Material.	2. Particulars of Burners, &c.	3. Value in Wax Candles, Six to the Pound.	4. Consumption of Material per Hour.	5. Units of Cost.	6. Cost per Hour for Light of equal Intensity.
			Ft.		d.
Lime light, with coal gas	Jet, 1/16 in. diam.	758·	7·2 oxy., 7·8 gas	9	1·00
Lime light, with hydrogen	Ditto, ditto.	1167·	6·53 oxy., 12·4 hyd.	10	1·11
Argand gaslight	Ditto, 15 holes	20·18	6·50 cubic feet	17	1·88
Fishtail ditto	Ditto, No. 1	7·*	2·41 ditto	18	2·00
Ditto ditto	Ditto, No. 4	6·66	5·00 ditto	40	4·44
Moderator oil light	Ditto, 1 in. diam.	19·5	860 grains	42	4·66
Argand ditto	Ditto, 15/16 in. do.	14·15	697 ditto	97	10·22
Bude ditto	Ditto, ditto.	151·25	4000 ditto	177	19·66
Wax candle	do. Six to the pound	1·	130·5 ditto	599	66·55

In the above table the various substances used to produce the light, are seen in col. 1. The respective intensities or values compared with a standard (a wax candle), in col. 3. The consumption of the respective materials, per hour, in col. 4. The units of cost, in col. 5; and the actual cost per hour for lights of equal intensity, in col. 6.

By careful reference to this table, it will be obvious that the lime light is the cheapest of all known lights.

During the last few months several successful applications of the lime light have been exhibited to the public, which have uniformly elicited very general satisfaction, viz.:—

As a lighthouse light (equal to 240 gas lights), to the Corporation of the Trinity House, by their permission.

As an internal light (equal to 300 gas lights), at the Crystal Palace, by permission of the directors.

As an internal light (equal to 1200 gas lights), in Westminster Hall, by permission of the Chief Commissioner of Her Majesty's Works and Public Buildings.

As an external light (equal to 480 gas lights), in New Palace Yard, during the session of 1859, by permission of the Chief Commissioner of Her Majesty's Works and Public Buildings.

As an external light (equal to 480 gas lights), in the Speaker's Court of the New Palace of Westminster, by desire of the Chief Commissioner of Her Majesty's Works and Public Buildings.

As a transmitted light (equal to 480 gas lights), through the transparent clock face of the New Palace of Westminster, by desire of Sir C. Barry.

As an external light (equal to 300 gas lights), at the public hall at Wisbeach, by desire of the mayor.

As a ship's light (equal to 480 gas lights), on the quarter-deck of the *Great Eastern* steam-vessel, by desire of the chairman of the directors.

As a public light (showing its application to street lighting (equal to 700 gas lights), on the New Westminster Bridge, by desire of T. Page, Esq., C.E.

As a beacon or coast light (equal to 90 gas lights), through a polygonal lens (by Chance Brothers) of great power, on Westminster Bridge, by permission of T. Page, Esq., C.E.

Preparations are making, amongst other objects, for lighting Milford Haven Pier, New Ryde Pier, for its application to military purposes, for the Coast Guard, for steam and other vessels, for the New Westminster Bridge (at its opening), and for mining service: and the company are negotiating for several other important applications of the light, both on land and afloat, and is prepared to supply this beautiful and economical light both in a *fixed* and *portable* form, for any of the many purposes for which light is required, at a rate unapproachable by any other known light.

* The gases have been employed in a compressed state in connexion with the lime light for many years past with success, and is therefore no novelty or untried device.

STOKE FENTON AND LONGTON GAS COMPANY.

The Annual Meeting of this Company was held on Wednesday, the 18th instant, at the Town-hall, Stoke-upon-Trent. The chairman of the company, F. W. Tomlinson, Esq., presided.

* A misprint in the original report, where this figure is printed as 0·7, is here corrected. The No. 4 fishtail burner which follows was evidently too small for the proper consumption of 5 cubic feet of gas per hour.—Ed. J. G. L.

The advertisement convening the meeting having been read, the revenue and capital accounts and the balance-sheet were laid before the proprietors.

The MANAGER (Mr. Young) then read to the meeting the report of the board of directors, which contained a statement of the negotiation with the British Gas Company, and the subsequent determination of the value of their property and interest in this district by the award of the referee, and the final transfer of the ceded district, which took place in November last. The company would now be placed in the position contemplated by the select committee of the House of Commons in the session of Parliament 1858 but for the opposition which has sprung up in Longton. It remains to be seen, however, whether the Longton Gas Company (Limited), will be able to justify in a court of law the infraction of this salutary arrangement, designed to protect the public from the inconvenience of frequent ob-truction to their highways by the operations of rival gas companies, and convince the court that, in spite of it, they are at liberty to enter upon an uncalled-for competition in the Longton district, without having sought or obtained parliamentary authority to break open the public highways and lay down their pipes therein. A special case was granted to present the facts in a shape to be argued before the Court of Queen's Bench, and it was settled and set down for hearing in the course of last November Term, and there is every reason to believe that it will be disposed of in the present Hilary Term. The directors have transferred at the close of the year a considerable sum to augment the reserve-fund and keep it in an efficient state to sustain the legal and contingent expenses to which the company are exposed, and they recommend that a dividend of 8 per cent. be now declared.

The CHAIRMAN, on rising to propose the adoption of the report, said that the accounts as examined by the auditors, and now laid before the shareholders, would no doubt be considered highly satisfactory; and one striking fact he would draw their attention to, that, notwithstanding the loss of the public lights and a portion of their consumers in Longton, and with the present low price of gas in that township, their income for gas and other products in their entire district was only £138 less this year than in the preceding one. He could not say, of course, what would be the issue of their law suits with the Longton Gas Company (Limited), nor would he ask them to share the confidence which he himself felt in the result, but he trusted that in a few days it would be made known. The arbitration with the British Gas Company (Limited) having been concluded, he would inform them of the position occupied by this company on that question. By a clause in the British Company's Act, power was given to this company to purchase their gas-mains, meters, &c., in the towns of Stoke Fenton and Longton, and before the termination of the specified period an offer was made by this company to purchase the property at a sum which, after very careful calculations, was considered to be a very liberal amount. The British Company, however, named a higher sum, and declined negotiations, preferring to leave the question of value to be determined by a referee appointed under the provisions of the Act, which we expressed ourselves anxious to avoid, in consequence of the necessarily heavy legal expenses which would be thereby incurred. Upon the hearing before the arbitrator, two out of our four engineering witnesses unfortunately were unable to attend; the exaggerated estimate of the value of the property was supported on the side of the British Company by Mr. Hawksley, Mr. Barlow, Mr. Laing, and Mr. Innes; and we were reduced to two, Mr. Robert Jones and Mr. T. Livesey, to oppose to them, and we felt most especially the disadvantage we sustained by the absence of Mr. King of Liverpool, who had been engaged upon the case from its commencement, and whom we intended to fire off against Mr. Hawksley, the great gun of the British Company. The case was conducted for us most skilfully by our solicitor, Mr. Keary, without the assistance of counsel; and with the lucid statement in evidence by our engineer, Mr. Young, and his triumphant refutation of the fallacies in the calculations of the British Company's engineers, with the valuable testimony of our two excellent witnesses, we received an award which was several hundred pounds less than we had in the first instance offered.

The accounts and the report were then passed, and a dividend of 8 per cent. declared; also a resolution authorizing the raising of further capital on debenture.

The retiring directors and auditors were re-elected, and a vote of thanks very cordially passed to the chairman and the board of directors for their services.

The chairman having left the chair and departed, the shareholders then formed themselves into a special meeting for the consideration of the best manner of testifying to the chairman, F. W. Tomlinson, Esq., the high appreciation which they entertained for his great abilities and invaluable services to the company.

DEATH CAUSED BY AN ESCAPE OF GAS.—An inquest has been held by Mr. Taylor, coroner, at Ossett, near Wakefield, touching the death of Elizabeth Redfearn. The deceased and her daughter, Hannah Redfearn, lived together at Ossett, and for some days had experienced a strong stench of gas in the house. They were rather surprised at this, as there were no gaspipes in it. On Friday night, the deceased and her daughter, prior to going to bed, felt the smell of gas much stronger. In the middle of the night, the daughter awoke, and finding herself suffering from a violent headache, and the stench of gas then being very strong, she wanted to get up to open the back door. Her mother, however, prevented her from doing so, and she went to sleep again. It was very near being her last sleep. Next morning, the neighbours were alarmed at the non-appearance of the Redfearns, the window-blinds remaining down, and the house closed up till an advanced hour in the morning. One of them at length effected an entrance through a window, and on going to the sleeping room of the inmates found Mrs. Redfearn and her daughter stretched in bed in a state of insensibility. There was an intolerable smell of gas in the house at the time. After some time it was discovered that both mother and daughter were alive, and they were restored to consciousness. The daughter eventually quite recovered, but the mother sank and died a few days afterwards. It was subsequently discovered that the gas-main, opposite to the yard leading to Redfearn's house, was broken across close to the sough or drain, and through this the gas had penetrated into the cellar of the house. Verdict—"Died through inhaling coal gas."

BITUMENIZED PAPER TUBING.—An experiment was recently made under the great Clock Tower, Westminster, for the purpose of testing the strength, by hydraulic pressure, of a novel description of tubing, composed of bitumenized paper, invented by M. Jalloureau, of Paris. M. Jalloureau is a contractor for paving Paris and other large towns in France with bitumenous concrete. In the course of his experiments, some paper which had been coated with bitumen was laid aside in a coiled form, and after some time it assumed a very stiff and solid shape. Pursuing the idea which accident thus developed, M. Jalloureau put several layers of bitumenized paper round a cylinder, and, submitting them to internal pressure, he found that a tube a quarter of an inch in thickness was capable of resisting a pressure of 250 lbs. to the square inch. The lightness of these tubes, their portability, their cheapness, and their non-liability to oxidation, induced the municipal authorities of Paris to try them for the conveyance of gas; and in the experiments in this country a piece of tube was produced, which, though stated to have been under ground in Paris as a gas-pipe for twelve months, had the appearance of being a perfectly new pipe. The tubes subjected to the pressure of the hydraulic pump bore a strain of 250 lbs. to the square inch without bursting, which is more than they would be ever called on to bear in ordinary use, being equal to 550 feet head of water. One of the tubes, half an inch thick, and with a bore of two inches, was also tested by weight, and it only gave way to a pressure of 428 lbs., the bearings being three feet apart. The engineers present expressed themselves entirely satisfied with the experiments, and considered that they might be substituted with advantage in many cases where iron tubes were now used. As to their capability of resisting heat, it was stated that they might be submitted to a temperature of 160° of Fahrenheit without any deterioration of the material. Of course, the economical consideration of price is a main ingredient in the practical value of all these inventions; and in this view we understand the new tubing has a decided superiority, as its cost is not one-half that of the ordinary iron piping. Messrs. Paul Joske and Alexander Young are the patentees of the invention in this country.

STATISTICS OF GAS LIGHTING IN PARIS.—According to the *Annuaire du Bureau des Longitudes* there are within the old boundaries of the *Boulevards exterieurs* 15,160 public gas lamps, 437 oil lamps, and 302,000 private gas lights; and, in the new district, between the exterior Boulevards and the fortifications, 2943 public gas lamps, 1683 oil lamps, and 56,000 private gas lights. The receipts of the Paris Gas Company, in 1859, amounted to £603,350, being £57,790 or 10·59 per cent. in excess of the receipts in 1858.

Price Current.

CASTINGS, PER TON.

Average Weight of Cast-Iron Gas-Pipes, per Yard.

1¼ in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lbs.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle.	Wales.	Yorkshire, Derbyshire, and Staffordsh.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Pig Iron, No. 1	4 0 0	2 17 6	3 5 0	3 5 0	3 10 0
1¼ and 2 inches Socket-Pipes	7 0 0	6 0 0	6 5 0	6 10 0	6 15 0
2½ and 3 " "	6 10 0	5 10 0	5 15 0	6 0 0	6 5 0
4 and 5 " "	6 0 0	5 0 0	5 5 0	5 10 0	5 15 0
6 in. and upwards "	5 15 0	4 15 0	5 0 0	5 5 0	5 10 0
Retorts, 1st fusion, hot blast	5 10 0	4 10 0	4 15 0	5 0 0	5 5 0
" 2nd " cold "	6 10 0	5 5 0	5 10 0	6 0 0	6 5 0
Tank Plates, ⅜ thick and above	6 0 0	5 0 0	5 5 0	5 10 0	5 10 0

WROUGHT-IRON TUBING,

Subject to 40 per cent. Discount.

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 12 ft., perft.	1 8	1 0	0 10	0 7	0 5	0 4½
" " " 6 in. to 18 in., each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting-Pieces, or Long Screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, Springs, and Elbows—wrought iron	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, wrought or cast	4 6	3 0	2 6	2 0	1 6	1 2
Iron Cocks	17 6	9 6	7 6	4 6	3 3	2 6
" with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Plain Sockets [Nipples	1 3	0 9	0 8	0 6	0 5	0 4
Syphons, 2 quart	1 0	0 8	0 7	0 5	0 4	0 3
	15 0	14 0	13 6	13 0	12 0	—

COALS, PER TON.

Newcastle.—Unscreened.		*Scotch Cannel.*	
Whitwell Primrose	6s. 3d.	Boghead, at Leith	45s. 0d.
Medomsley, Eighton Moor, and Burnhope	6 6	Kirkness, best	23 0
Pelaw	6 9	Capeldrae, 1st quality	20 0
New Pelton, Peareth, South Pelaw, Washington Hutton, and South Peareth	7 0	" 2nd "	12 6
Pelton	7 9	Lesmahago, at Glasgow	25 0
Ramsay's Newcastle Cannel	16 0	" " Leith	27 6
		Arniston	22 0
		Wemyss	20 0
		Knightswood	18 0
		Pirnie	15 0

SUNDRIES.

Best Newcastle Fire-bricks	per 1000	50s. 0d.	
Cliff's Fire-bricks, at Wortley	per 1000	57 6	
Ingham's Fire-bricks, at Wortley	"	55 0	
Fire-clay Retorts	per foot run,	5s. 6d. to 7 0	
Tough Cake Copper	per ton	£117 0s.	
English Pig Lead	"	22 15	
Welch Bar Iron, in London	"	6 15 0	
Tarred Rope Yarn	per cwt.	26s. 0d.	
Foreign Spelter	per ton	£ 21 10 0	
English Block Tin	"	138 0 0	
Banca	"	139 0 0	

FREIGHTS.

Coastwise—Newcastle.—Per Ton.		*Foreign.—Per Keel.*	
Chatham & Rochester	6s. 11½	Boulogne and Calais	£8 0 0
Cork	10 6	Barcelona	23 10 0
Dover	8 0	Bordeaux	16 0 0
Dublin	12 0	Cadiz	16 0 0
Exeter Quay	10 6	Copenhagen	—
Folkestone	8 0	Dieppe	10 15 0
London (Pool)	6 9	Genoa	23 0 0
Lowestoft & Yarmouth	5 0	Hamburg	10 0 0
Lynn	—	Havre	9 10 0
Portsmouth	7 3	Leghorn	23 0 0
Plymouth	9 0	Lisbon	16 0 0
Ramsgate	8 0	Rotterdam	—
Whitstable	7 0	Stettin	9 15 0
Weymouth	—	Trieste & Venice	£24 to 26 0 0

MR. N. DEFRIES, Consulting Gas ENGINEER, 5, FITZROY SQUARE, begs to acquaint the Scientific World and Inventors generally, that he has Clients who are desirous of investing either small or large sums in any good and sound Inventions which he might deem worthy of his recommendation.

Apply by letter as above.

Dec. 27, 1859.

GAS, WATER, MINING, AND GENERAL ENGINEERING.

MR. PRESTON LUMB having changed his Offices to 16, NORTHUMBERLAND STREET, STRAND, W.C., feels it incumbent upon him to announce to his clients and others that he may be consulted (from 10 to 5) in every branch of Engineering. His twenty-five years' experience and success, *especially in the construction and leasing of Gas-Works*, has enabled him to increase his hitherto extensive and efficient staff, so that Boards of Directors may confidently rely upon his prompt attention. He has also the command of a large amount of Capital for Engineering enterprise.

London, 16, Northumberland Street,
Strand, W.C., Jan., 1860.

TO GAS & WATER COMPANIES, ENGINEERS AND FITTERS.

GARSIDE'S Registered Tube-Vice holds all sizes of Wrought-Iron and Brass Tubes with the greatest firmness and least possible pressure; consequently it is not so liable to split or damage the Tubes as the ordinary Vice, and considerably facilitates the Workman, who may do almost double the quantity of work. Also,

GARSIDE'S IMPROVED MAIN-DRILLING CLIPS, for Drilling Holes for Service-Pipes. With this instrument the perforation of Pipes for the attachment of smaller Tubes can be effected with great ease and precision. Likewise,

HEAP'S REGISTERED GAS TONGS, most highly approved of as vastly superior to those in present use. Stocks, Taps, and Dies, together with all tools connected with Gas Engineering.

For Drawings, Testimonials, and prices, apply to the Maker, S. GARSIDE, Stamford St., ASHTON-UNDER-LYNE.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of Clay Retorts, Fire Bricks, and every description of Fire Clay Goods.

GEORGE ANDERSON, Gas and CONSULTING ENGINEER,
104, LEADENHALL STREET, LONDON (E.C.).

DIRECT-ACTING GAS-EXHAUSTERS,
supplied either with or without Steam-Engines and Boilers.

FOUR-WAY DIAPHRAGM VALVES,
one of which answers the purpose of THREE ordinary Valves, as applied to Purifiers, or in shutting off and passing Station-Meters, Governors, or other apparatus, while the Connecting-Pipes are also much simplified.

RETORT SETTINGS,
designed to be heated by Tar alone, and with a total absence of Smoke.

Illustrated circulars, giving references and every information, may be obtained on application as above.

TO Mr. BENJAMIN WHITEHOUSE,
GASHOLDER MAKER,
WESTBROMWICH, NEAR BIRMINGHAM.

Sir,—I feel great pleasure in expressing my satisfaction at the manner in which you discharged your duties as CONTRACTOR for the TELESCOPIC GASHOLDER, 150 feet diameter and 60 feet deep, erected at this Company's Nine Elm Station in 1857. From that period to the present I have closely watched its working, and have never found the least defect either in workmanship or material.

During the recent heavy gales the Gasholder, although containing upwards of 1,000,000 cubic feet of Gas, showed no perceptible indications of its influence, but worked as freely and easily as usual.

RICHARD JONES.
Engineer to the London Gaslight Company.
Vauxhall, London, Nov. 9, 1859.

ALFRED PENNY, Engineer,
WENLOCK IRON WORKS,
WHARF ROAD, CITY ROAD, LONDON.

Mr. PENNY begs to inform Gas and Water Companies that he undertakes the erection of new, or the alteration of existing, works; and that he may be consulted generally on all matters connected with gas and water supply. He is also prepared to supply best Cold-blast Retorts, Socket-Pipes, and Connections, Iron Borings, &c. &c., and all the necessary Castings used in Gas and Water-Works.

*** Country orders executed with care and despatch.

JOHN ROGERSON and CO.,
NEWCASTLE-ON-TYNE & MIDDLESBRO'-ON-TEES.

Wrought and Cast Iron Pipes, Cast-Iron Retorts, and all kinds of Foundry Work necessary for Gas-Works. Fire-Bricks and Clay Retorts. Gas Coals of every description. Pig, Bar, and Plate Iron.

LONDON HOUSE:
12, ROYAL EXCHANGE BUILDINGS.

GAS PURIFYING BY REVIVIFIABLE OXIDE OF MANGANESE.

MR. LAMING (Inventor of the Revivified Oxide of Iron Purification) begs to inform Gas Engineers that they may now supersede the material in general use by A REVIVIFIABLE OXIDE OF MANGANESE of his preparing, which in efficacy is at least equal, and in economy superior, to Oxide of Iron. Owing to the greater chemical activity of Manganese, common dry-lime purifiers of ordinary capacity will often be amply sufficient for it, though they may be too small for the Oxide of Iron material.

For Gas-Works possessing steam power, more especially such as are exposed to public complaint, Mr. Laming recommends the purification to be done either wholly or in part (depending on extent of apparatus) in out-of-doors scrubbers, hermetically sealed, by means of his liquid process, which is both economical, and meets all practical requirements.

118, Fenchurch Street, Aug. 1, 1859.

THE STANDARD CUBIC FOOT.

E. W. LADD and CO. are now prepared to supply Copies of the Standard Cubic Foot constructed by them for the Office of Her Majesty's Exchequer.

E. W. LADD AND CO.,

Standard Weight and Measure Manufacturers, and Hydrometer, &c., Makers to the Board of Inland Revenue,

1, OLD JEWRY, LONDON.

WILLIAM SUGG,

GAS ENGINEER, AND MANUFACTURER OF GAS APPARATUS, METERS, PHOTOMETERS, GOVERNORS, &c.,

MANUFACTURER OF

THE NEW EVANS PHOTOMETER,

Suggested by Mr. F. J. EVANS, of the Chartered Gaslight Company.

The advantages of this Photometer consist in not requiring a Dark Room, as it is complete in itself. It can be used in any ordinary Room, by daylight, or in the open air if necessary. The results obtained by it are much more accurate than by any other Photometer at present in use, while the manipulation is so easy and pleasant that an experimenter may operate for hours together without fatigue to the eyes. This alone is an advantage which all who make such experiments will fully appreciate.

One of these instruments, fixed in working order, can be seen and tested at the Manufactory, 19 and 20, Marsham Street, Westminster, where all further particulars may be obtained.

MANUFACTURER ALSO OF

EXPERIMENTAL METERS AND GOVERNORS

for use with the above,

MINUTE CLOCKS, TESTING GASHOLDERS,

AND GENERAL EXPERIMENTAL APPARATUS OF THE BEST QUALITY.

STATION METERS, STATION GOVERNORS,

IMPROVED CONSUMERS' DRY METERS AND COMPENSATING, WATER-BOX, ENCLOSED FLOAT,

and other kinds of Water-Meters, all to suit the New Gas Act.

STREET LAMP GOVERNORS,

fitted with cased Lava Burners, regulated to burn any required quantity per Hour, which quantity they will maintain under any excess of Pressure.

LAVA BURNERS,

ARGAND PHOTOMETER 15-HOLE PARLIAMENTARY BURNERS, ARGAND DRILLED AND SUN-RING BURNERS, DOUBLE BATWING, BATWING AND FISHTAIL, STAR, CRESCENT, AND FIR-TREE BURNERS, AND BUNSEN CHEMICAL BURNERS.

These Burners being perfectly incorrodible and indestructible by heat, will remain in order for years, while their superior finish and cutting have secured for them the approbation of all who are interested in Public and Private Lighting.

GAS-METER AND APPARATUS WORKS,

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WANTED, by a Provincial Gas COMPANY, an experienced METER-MAKER, of good character and steady habits.
Applications, stating age, present and former employers, and wages expected, to be addressed to Mr. P. SHUTTLEWORTH, Cheny Street, BIRMINGHAM.
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WANTED, by a young Man, aged 23, a Situation as MANAGER of a small Gas-Works. Would be willing to perform all the duties attendant on Manufacture and Distribution, can lay Main and Service Pipes, repair Apparatus, &c. &c. Can have good Testimonials for character and ability from the Company with whom he is now engaged.
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TO be disposed of cheap, the under-mentioned Apparatus and Castings, viz:—
2 Dry-Lime Purifiers, complete, with Covers, Sieves, &c.;
8 Lengths of Hydraulic Main, with Stand, Arch, and Dip-Pipes;
30 Circular Retort Mouth-Pieces, and 60 Lids;
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Particulars as to size, price, &c., will be forwarded on application to Mr. J. L. COCKER, Gas-Works, Merthyr Tydvil, GLAMORGANSHIRE.

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GLOBE PATENT TUBE WORKS, WEDNESBURY,
Beg to draw the attention of Engineers and Managers of Gas Works to the superior quality of the Article they manufacture, both in respect of the iron employed, and the perfect manner in which it is welded; in proof of which they can refer to the testimonials of the most eminent Gas Engineers, and the experience of the principal of the large Gas Companies of the kingdom.
Orders promptly executed.

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Specification to include the Erection of the Holder at the Works in Wicklow, and also necessary pipes, &c., for connecting the Holder to the present Works, but not to include the Tank.
The lowest Tender will not necessarily be accepted.
Tenders will be received by the Secretary up to Monday, the 20th of February, at the hour of 12 o'clock noon. ROBERT HALPIN, Secretary.
Wicklow, Jan. 25, 1860.

WANTED, a Situation as Manager, or FOREMAN in a Gas-Works, by one who thoroughly understands his business in all its branches. Good Testimonials can be given.
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WANTED by the Advertiser. 33 years of age and married, a Situation as MANAGER of a Gas-Works. Has been Engaged Fifteen years in different Gas-Works, understands the Setting and Working of Iron and Clay Retorts, taking the Registration of Consumers' Meters, the keeping of Daily Returns from Stokers and Accounts, Main and Service-Laying, and everything connected with the Manufacture and Distribution of Gas. Can forward, on application, satisfactory Testimonials.
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THE Directors of the Over Darwen GASLIGHT COMPANY are prepared to receive Tenders for the Construction and Erection of a TELESCOPIC GASHOLDER, 102 feet diameter, in two lifts of 22 feet each.
The Plans may be seen and Specifications had on application to the Engineer, at the Works, Charles Street, Over Darwen, on and after Friday next, the 3rd day of February.
Sealed Tenders, endorsed "Tender for Gasholder," addressed to JAMES SHORROCK, Esq., Chairman of the Over Darwen Gaslight Company, to be sent in, on or before the 29th day of February next.
The Directors do not bind themselves to accept the lowest, or any Tender.
JAMES L. HAWTHORN, Engineer.

TO GASHOLDER MAKERS.

THE Directors of the Sutton, South-COATES, and DRYPOOL GAS COMPANY, Hull, are desirous to receive Tenders from persons to supply and erect at their Works a GASHOLDER, 80 feet diameter by 16 feet deep.
Plans and Specifications may be seen at 9, Prince Street, Hull. Copy of Plan and Specifications furnished on receipt of P. O. O. for 10s. 6d. Apply to Mr. John Jackman, Engineer, 9, Prince Street, Hull.
Tenders to be sealed and endorsed "Tender for Gasholder," addressed to the CHAIRMAN of the Company, and must be sent in not later than Feb. 25.
The Company do not bind themselves to accept the lowest, or any Tender.
Jan. 27, 1860.

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THE Gas Engineering and General IRON-WORK COMPANY (LIMITED) are now prepared to furnish Estimates and undertake Contracts for Gas-Works complete. Iron Roofs, Boiler, or Wrought-Iron Work of any description.
Works: WENLOCK ROAD, CITY ROAD, N.
Prospectuses, with Forms of Application for the few remaining Shares, can be obtained of the Secretary, A. ROSS, Esq., at the Offices of the Company, 11, Pancras Lane, Queen Street, CHEAPSIDE.

GAS Apparatus of every kind, and their action explained and thoroughly tested as to the practicability of HEATING BATHS, Conservatories, Halls, Public Buildings, &c., for all kinds of Cooking and Domestic Purposes, at PHILLIPS'S MANUFACTORY, 55, Skinner Street, SNOW HILL, E.C. (the Original Inventor and Patentee), Gas-Fitter by appointment to Her Majesty's Government and many of the Nobility.
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Shippers of Fire-Goods of First-class quality manufactured from a remarkably pure seam of Fire-Clay.
Railway Communication by Broad or Narrow Gauge with all parts of the Kingdom, and by Seaboard, Coastwise, and Foreign.

FOR SALE, a Small Direct-Action STEAM-ENGINE, in good condition, 6-inch Cylinder, 12-inch stroke.
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Patentee and Manufacturer of all kinds of Cooking Apparatus, Baths, Conservatory Boilers, &c., for Gas. Gas Stoves from 16s.; Cooking Apparatus from £1. Every article warranted.
N.B.—Public and Private Establishments fitted by Gas or Hot Water.

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11s. per Dozen.
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DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and CLAY, and every Article suitable for
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Station and Experimental Meters, Gas Pressure Registers, Gauges, Experimental Gasholders, Governors, Slide Valves, &c. &c.
W. and G. would respectfully call the attention of Gas Engineers and Managers to their Station-meters, having made and erected the largest in use at the present time, two of which may be seen at the Stockport and Liverpool Gas Works, on application to the respective Engineers.

M. SHEEN, Gas and Railway Lantern Maker, 90½, Holborn Hill, begs to inform Managers of Gas-Works, &c., that she continues to contract and supply Lanterns on reasonable terms, and keep them in repair by the year.

EIGHTON MOOR GAS COALS.—Parties wishing to be supplied with these first-class Gas Coals will please to apply to Mr. MATTHEW NESBIT, EIGHTON MOOR OFFICE, NEWCASTLE-UPON-TYNE. These coals are well known as among the richest in gas, and working the roundest on the River Tyne. They are extensively used by metropolitan gas works.

WROUGHT-IRON Guides for Gas-HOLDERS, when Trussed upon scientific principles, are more capable of resisting strains, in every direction, than Cast Columns of any form can be; and weigh only one-fifth as much as the latter. Designs and Working Drawings for Guides and Ties can be obtained of the Inventor, CHARLES DIXON, C.E., Chichester, SUSSEX.

CAUTION.
TO GAS-METER MANUFACTURERS AND OTHERS.
THE Undersigned hereby caution Meter Manufacturers and others against infringing the exclusive right of the Undersigned to the use of the Screw Adjustment for regulating the Height of the Overflow-Pipes in Wet Gas-Meters, as described in the Specification of the Letters Patent granted to Crosley and Goldsmith on the 19th of April, 1856; as well as against infringing any other portions of that or any other Patent of the said William Crosley; and
NOTICE is further given, that all Infringers of the said Inventions, or any portions of them, will be proceeded against. CROSLEY & CO.,
103, SOUTHWARK BRIDGE ROAD,
LONDON, Aug. 29, 1859.

WALTER MABON, Engineer,
ARDWICK IRON WORKS, FAIRFIELD STREET
MANCHESTER,
Manufacturer of
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GASHOLDERS.—Extensive premises at Gorton, solely for the manufacture of Gasholders, and other heavy Wrought-Iron Structures.
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WROUGHT and CAST IRON ROOFS for Railway Stations, Gas Works, Warehouses, and Sheds, prepared for Slates or for Corrugated Iron.
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PIPES and VALVES, for Gas and Water, from 2 inches to 48 inches bore.

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WOLVERHAMPTON PATENT WROUGHT-IRON TUBE WORKS,
Originally established in 1833,
Manufacturer of Gas and other Tubes, Fittings, and articles of every description belonging to Gas, Water, or Steam.

E. D. had the honour of receiving the

PRIZE MEDAL

awarded to this Manufacture by the COUNCIL of the GREAT ENGLISH EXHIBITION of 1851; and from the latter date has supplied many towns exclusively with GALVANIZED and other Tubes for Gas and Water, under GOVERNMENT ENGINEERS.

A City, containing 150,000 inhabitants,

has recently been entirely supplied with Tubes made at the above-named Works, and several others with populations nearly as great; in fact, the reputation now acquired induces this notice to the public.
Large Stocks generally on hand, averaging from one to three hundred thousand feet.

HYDRAULIC PRESS TUBES,

to resist 6000 lbs. and upwards to the square inch, extensively manufactured.

STOCK DIES and SCREWING TACKLE

of the best possible description.
Every Tube carefully tested with Hydraulic Pressure before leaving the Works.

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SPRING GARDEN IRON-WORKS,
DUDLEY, near BIRMINGHAM,
Manufacturers of Gas Apparatus in all its branches.
A large assortment of New and Second-hand Gas Apparatus constantly for Sale.
Gas Apparatus Enlarged and Exchanged.

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JAMES FERGUSON and CO., Lessees of the Auchinheath and Craignethan Gas Coal-fields (the most extensive and valuable in the parish of Lesmahago), respectfully intimate to the Managers of Gas-Works and Consumers of Gas Coal, that they are prepared to ship the best quality of the above well-known COALS at Glasgow or Leith; and also to deliver them at the railway stations upon, or connected with, the Caledonian Railway, to any extent which may be required.
Price, free on board, or delivered at the railway stations, may be learned by addressing James Ferguson and Co., Gas-Coal Works, Lesmahago.
Shipping Agent for Glasgow:
MR. ALEXANDER STRATTON,
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WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE,
MANUFACTURERS OF EVERY DESCRIPTION OF
FIRE BRICKS, CLAY RETORTS, LUMPS, TILES,
&c. &c.
LONDON OFFICES:
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A large stock of Fire-Clay Goods always on hand in London, at the lowest wharf prices, at Messrs. CHRISTIE & Co.'s Wharf, 64, Bankside, SOUTHWARK.

CHARLES BOTTEN and SON,
ENGINEERS & METER-MAKERS,
CRAWFORD PASSAGE, RAY STREET,
CLERKENWELL, LONDON (E. C.).
Manufacturers of Station and Patent Protector Consumers' Meters, Patent Slide-Valves, Gas-Fittings, Pipes, &c.
Also, High-pressure Cocks, Hydrants, Closets, and all Water-Fittings.

LEONI'S Patent Adamas Gas-BURNERS (secured by Her Majesty's Royal Letters Patent), are entirely free from liability to CORROSION, injury from Heat, or danger of Fracture, and are UNALTERABLE in the dimensions of their Apertures.
Uniformity in the consumption of Gas is obtained by the process of manufacture, which ensures that the Burners shall be of precisely similar pattern.
The Adamas Burners are confidently recommended to Gas-Fitters, Consumers, and Companies.
Sole Manufacturer and Patentee in Great Britain, S. LEONI, Adamas Works, St. Paul Street, New North Road, LONDON, N.

METROPOLITAN BOARD OF WORKS.
MAIN DRAINAGE OF METROPOLIS.
MIDDLE-LEVEL SEWER.

TO Builders and Contractors ex-perienced in Tunnel Works. The Metropolitan Board of Works hereby give notice, that they will MEET in the Council Chamber, Guildhall, in the City of London, on FRIDAY, the 17th day of February next, at TWELVE o'clock at Noon precisely, and will then be prepared to open TENDERS by parties who may be willing to CONTRACT for the CONSTRUCTION of MAIN BRICK SEWERS, 12 miles 1280 feet in length, or thereabouts (33,862 feet of this length being in tunnel), and for the execution of other works in connexion therewith, to extend from a point between the Northern High-Level Sewer, East of Sir George Duckett's Canal and the Western Arm of the Counter's Creek Main Sewer, near Kensal Green, in the county of Middlesex.
Parties desirous of submitting Tenders may, upon payment of £3, obtain Plans, Sections, Specification, Form of Tender, and other particulars, on application to Mr. J. W. BAZALGETTE, Engineer of the Board, at the Office of the Board, between the hours of Nine a.m. and Four p.m.
Tenders, addressed to the Metropolitan Board of Works, must be delivered at the Office of the Board, No 1, Greek Street, SOHO, before Four o'clock p.m., on Thursday, the 16th day of February next, and no Tender will be received after that hour.
The Board do not bind themselves to accept the lowest or any Tender, and the party whose Tender shall be accepted will be required to provide two approved sureties for the due performance of the works.
JOHN POLLARD, Clerk of the Board.
No. 1, Greek Street, Soho, Jan. 9, 1860.

FIRE-CLAY RETORTS.

JOHN SWARBRICK,

MANUFACTURER OF PATENT COMPOSITION CLAY RETORTS,
FIRE BRICKS OF EVERY DESCRIPTION, SHAPE, AND SIZE, &c. &c.
HIGHER EANAM, BLACKBURN, LANCASHIRE.

These RETORTS are generally used in the Gas-works of Preston, Accrington, Bury, Heywood, Middleton, Rochdale, Ratcliffe; the Mills of Messrs. Horrocks, Miller, and Co., Preston, &c. &c., and are unequalled in having afforded general satisfaction to those who have given these Retorts a trial.
To meet the increasing demand, the Works at Little Harwood have been greatly enlarged; and Gas Engineers who may favour with an Order may rely with confidence on their being promptly supplied with an article not to be surpassed in finish or durability.

PRICES MODERATE.

LIVESEY FIRE-CLAY WORKS,
NEAR BLACKBURN, LANCASHIRE.

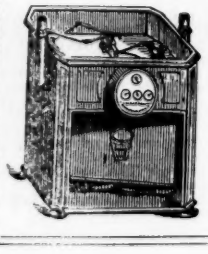
ORLANDO BROTHERS,

MANUFACTURER OF PATENT CLAY RETORTS,
AND EVERY DESCRIPTION OF
TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.
FIRE-BRICKS, TILES, BLOCKS, AND CHIMNEY-TOPS.

ESSON'S PATENT
COMPENSATING GAS-METER

Is guaranteed correct within the meaning of the "Sale of Gas Act." Manufactured only by WILLIAM COWAN, Buccleuch Street Works, EDINBURGH; and St. Mary's Gate, MANCHESTER.—Established 1827.

BOULTON'S PATENT DRY GAS-METERS,



Of which upwards of 24,000 are at present in use, having gained for themselves an unparalleled patronage from all the principal Gas Companies and Consumers, on account of their unerring registration and the superior workmanship and materials used in their construction, enables the Patentee to sell them now at competitive prices with those of other makers.
Every description of Improved Wet or Patent Dry Meters and Gas Apparatus manufactured by

JOSEPH BOULTON,
28, BAGNIGGE WELLS ROAD, CLERKENWELL.

All Meters warranted to comply with the requirements of Lord Redesdale's "Sale of Gas Act."

CROSLEY & GOLDSMITH'S

PATENT SELF-ADJUSTING & COMPENSATING GAS-METERS

CANNOT BE OVER OR UNDERCHARGED WITH WATER,

and they consequently register the quantity of Gas consumed with greater accuracy than Meters in which the Water-Line is variable.

MANUFACTURED BY

CROSLEY & CO.,

GAS-METER MANUFACTURERS,

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N.B. The Patent Self-Adjusting and Compensating Apparatus may be applied to the ordinary Meter.

Manufacturers of LOWE'S PATENT MOTIVE-POWER METER, for situations where there is an inadequacy of pressure to supply the special requirements of certain consumers in low grounds during the day or night.

Also, Manufacturers of EXPERIMENT METERS, GASHOLDERS, GOVERNORS, MINUTE-CLOCKS, PHOTOMETERS, &c. &c., similar to those used by Mr. King, of Liverpool.

C. and Co. are the only house in the trade which has for years manufactured Meters according to the standard measure set forth in the 2nd Section of the "Sale of Gas Act," and which also comply with the rules laid down in the Section for testing meters. Purchasers of C. and Co.'s Meters may therefore be secured against any additional expenses being incurred in order to adapt their Meters to the requirements of the new Act.

WILLIAM PARKINSON AND CO.,

(SUCCESSORS TO THE LATE SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.,

PATENTEES AND MANUFACTURERS OF

GAS-METERS, GOVERNORS, AND OTHER APPARATUS;

ALSO,

METERS FOR MEASURING WATER, &c., &c.

IMPROVED LOW-SPOUTED GAS-METERS,

Which completely meet the requirements of Lord Redesdale's Sale of Gas Act, and are as simple in their construction, satisfactory in working, and as low in price as the well-known Meters which have been made by W. P. and Co., and their predecessor, Mr. Samuel Crosley, during the last forty years, and of which there are about 300,000 now in use.

STATION-METERS AND GOVERNORS

Of all Sizes, of the best Construction, Materials, and Workmanship, supplied on he shortest notice.

There are about 300 Station-Meters at work of their manufacture, of sizes varying from 750 to 60,000 cubic feet per hour, of which the following are some of the principal ones, recently supplied by them to London Gas Companies, viz. :—

2	for	60,000	cubic feet per hour each	to the Chartered Gaslight and Coke Company, Westminster;
1	„	40,000	„ „	Chartered Gaslight and Coke Company, Brick Lane;
2	„	60,000	„ „	London Gaslight Company, Vauxhall;
1	„	60,000	„ „	Commercial Gas Company, Stepney;
1	„	40,000	„ „	Equitable Gas Company, Pimlico;
1	„	40,000	„ „	Phœnix Gaslight Company, Greenwich,

&c. &c. &c.

And they have also supplied large Station-Meters to the Gas Companies at Birmingham, Nottingham, Sheffield, Southampton, Leeds, Newport, Glasgow, Manchester, Dublin, Cork, and all the principal towns in the United Kingdom, as well as many on the Continent, &c., &c.

Their Station Gas-Governors have been adopted by most of the above-named Companies, and have given universal satisfaction.

PRESSURE REGISTERS, EXPERIMENTAL METERS, PHOTOMETERS,

Minute Clocks, Consumers' Gas-Governors, Pressure-Gauges,

STANDARD EXPERIMENTAL GASHOLDERS FOR PROVING METERS, &c.

GEORGE LOWE'S PATENT NAPHTHA BOXES AND MOTIVE-POWER METERS,

WITH MACHINERY FOR WEIGHTS TO ASSIST THE SUPPLY OF GAS WHERE THE PRESSURE IS LOW.

SPECIFIC GRAVITY APPARATUS, RAIN GAUGES, &c.

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PATENT DRY AND WET GAS-METER MANUFACTURER,

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ESTABLISHED 1836.

J. M. invites attention to his Improvements in EXPERIMENTAL WET GAS-METERS, by which he renders impossible any Leakage from the Stuffing-Box.

These METERS are GUARANTEED to meet all the REQUIREMENTS of the SALE OF GAS ACT.

GOVERNORS, STATION-METERS. PHOTOMETERS,

EXPERIMENTAL TESTING GASHOLDERS, HIGH-PRESSURE GAUGES,

AND ALL APPARATUS IN USE AT THE GAS MANUFACTORY.

CANNEL and COAL of the best descriptions for making GAS and COKE.
(As per Analyses.)

GAS CANNEL, 17s., 15s. 6d., and 14s. per ton.
GAS COAL, 11s. 6d., 9s. 6d., and 8s. 6d. per ton.
STEAM COAL, 10s., 9s. 6d., and 9s. per ton.
All free on board Vessels in Liverpool.

Handpicked Cannel and Coal about 10 per cent. additional. Concession in prices made for large quantities.

GAS APPARATUS of all descriptions, and on the most approved principles; also Purifying and other materials supplied.

ANALYSES, PLANS, and ESTIMATES, and other information required, and the highest references furnished on application.

CONTRACTS for Materials and Works entered into.

No charge made for Superintending Shipments, Preparing Bills of Lading, or passing Entries.

EMANUEL TURNER and CO.,
EXPORT OFFICES:
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GAS-METER AND APPARATUS WORKS,

GRAY'S INN ROAD, LONDON.

MANUFACTURERS OF WET AND DRY GAS-METERS, STATION-METERS, GOVERNORS, EXPERIMENTAL APPARATUS, &c. &c.

Sole Manufacturers of Sanders's Patent Compensator for maintaining a correct Water-Level in the Meter without impeding its legitimate action.

All Meters manufactured by P. and F. are guaranteed to be in strict conformity with Lord Redesdale's Sale of Gas Act.

A large number of **STATION-METERS,** up to 80,000 feet per hour (being by far the largest in use), and **GOVERNORS** for **MAINS,** up to 24 inches, have been constructed by Paddon and Ford. These Meters and Governors possess peculiar advantages as regards strength and freedom of action. The Meters are warranted to offer less resistance than Meters generally.

Manufacturers also of **PADDON'S PATENT STREET-LAMP REGULATORS,** for insuring any required consumption. These Regulators are in general and increasing use, and references can be given to Gas Companies who use them for every Lamp.

Contractors for the erection or alteration of Gas-Works, and every description of apparatus required in Gas-Works supplied.

ALEXANDER WRIGHT,

55 and 55A, MILLBANK STREET, WESTMINSTER, S.W.,

MANUFACTURER OF

Consumers' Wet Gas-Meters,

Of the best material and workmanship, carefully adjusted to meet the requirements of the SALES OF GAS ACT.

Consumers' Compensating Gas-Meters,

Which have secured the highest approbation and patronage, on account of their simplicity of construction, thorough efficiency, and moderate price.

Station-Meters and Governors,

Of all sizes, constructed with the most careful regard to durability, accuracy, and freedom from excessive friction. A LARGE NUMBER are in use, and give perfect satisfaction.

Experimental Testing Apparatus,

COMPRISING

PHOTOMETERS, SPECIFIC GRAVITY APPARATUS, BI-SULPHURET OF CARBON TEST, THOMPSON'S BROMINE AND HEATING POWER OF FUEL TESTS, IMPROVED ALKALIMETER, EXPERIMENTAL METERS AND GOVERNORS, MINUTE CLOCKS, &c., &c.

These apparatus are employed by the best experimenters in this country and on the continent, and by nearly all the Gas Companies in London, for the use of the appointed testers in the various districts.

Wright's Registering Pressure-Gauge,

Is universally used, and affords valuable aid in effecting a due regulation of pressure, thereby saving much of the leakage arising from heavy pressures when the consumption is decreasing.

Wright's Exhauster Register and Regulator,

are of the highest utility, as by the one a due check is maintained on the working of the Exhauster, and by the other all possibility of excessive exhaust is avoided.

Test Gasholders,

Of all sizes, of the most perfect character, accurately graduated to the Exchequer Standard.

Consumers' Governors; Inspectors' Pocket, King's, and all other kinds of Pressure-Gauges; Thermometers for Condensers, &c., &c.

"Analysis of Gas for Practical Men," by A. WRIGHT, M. Inst. C.E., post-free for 13 Stamps.

PRICE-LISTS ON APPLICATION.

FIRE-CLAY GAS RETORTS.

ESTABLISHED IN 1795.

JOSEPH CLIFF,

WORTLEY FIRE-BRICK WORKS, near LEEDS.

THESE RETORTS are unrivalled in excellence, being the BEST FINISHED INTERNALLY, and THE MOST CORRECT IN FORM, of any in the Kingdom. From the peculiar composition used in working up the face of the material, they are rendered unusually smooth, close, and FREE FROM SURFACE CRACKS, thus, in a great measure, preventing leakage and the adhesion of carbon to their interior surface.

To meet the yearly increasing demand of UPWARDS OF THIRTY SEASONS and to carry out the late improvements in the manufacture, the Premises have been re-erected and much enlarged, and Engineers may rely WITH CONFIDENCE on their orders being completed with a greater regard to despatch than by any other House.

THE WORKS ARE WELL SITUATED

For EXPORT from the Ports of { LONDON, LIVERPOOL, HULL, MIDDLESBRO', HARTLEPOOL, and STOCKTON.

FIRE-BRICKS, LUMPS, GUARDS, TILES, AND CLAY OF THE SAME QUALITY.

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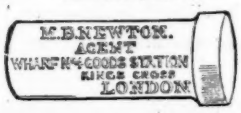
J. CLIFF'S Fire Bricks, Clay RETORTS, &c.



Orders for London and South of England to be addressed to Mr. NEWTON, Agent for the District, 16, Castle Terrace, New Hampstead Road, KENTISH TOWN, N.W.

N.B.—A few Retorts of each size, and a large stock of Bricks and Lumps, always on hand at the above Wharf.

KINSON FIRE BRICKS are indestructible by heat, and are warranted to last twice as long as Stourbridge, Newcastle, or Welsh bricks. 80s. per 1000 at Nine Elms Station.

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WILLIAM RYDER, General MINERAL AND METAL AGENT AND MERCHANT, 4, DEAN STREET, NEWCASTLE-ON-TYNE,

is prepared to supply Gas and Water Companies with Apparatus and Appliances of every description, including Cast and Wrought Iron Goods, Coals, Fire-Bricks, Retorts, &c. &c.

Any communications addressed to him as above shall have prompt attention.

GEORGE CUTLER, Gasholder MAKER,

No. 8, WENLOCK-ROAD, CITY-ROAD, LONDON.

Contracts for Tanks, Gasholders, Roofs, Purifiers, and all descriptions of Gas Apparatus executed on the most reasonable terms. Improved Slide Valves, Steam, and Range Boilers, and Smiths' Work, of the best materials and workmanship.

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Manufacturer of every description of Fire-Bricks, Lumps, Quarries, Shields, Flue Covers, &c., to any size or shape required.

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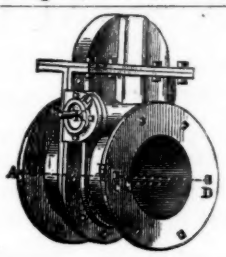
B. G. begs to call the attention of Gas Companies to his Fire-Clay Retorts, which have been used with great satisfaction in some of the largest Gas-Works in the Metropolis and many Provincial Towns in England.

References given, if required.



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IMPROVED GAS VALVES

from 2 inches to 18 inches, price 11s. 6d. to 13s. 6d. per inch diameter

List of prices, with full dimensions of all sizes up to 27 inches, to be had on application.

These Valves are all proved to 30 lbs. on the square inch before leaving the works.

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Manufactory for every description of Casting and Machinery for Gas Works and Water Works.

Warehouse in London for Cast-iron Pipes and Connections of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

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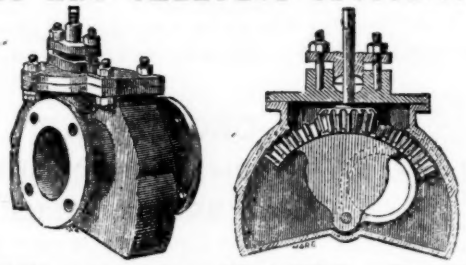
Late in the occupation of J. and W. King. Originally J. Pidcock, Esq.

BEST AND CHEAPEST SLUICE-COCK.



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Above 3-inch diameter, price 10s. per inch. Brass face, 6d. per inch extra.

Can be taken to pieces without being removed from the line of Piping.

NORTH WILTS FOUNDRY, DEVIZES.

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WILLIAM INGHAM AND SONS,

WORTLEY FIRE-BRICK AND RETORT WORKS,

Near

Leeds.

W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of

RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY,

beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.

The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

London Agents: CHADWICK and AKEROYD, Willington Stone Wharf, Regent's Park Basin.

A large stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all sizes kept in London at CHRISTIE & CO.—Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

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JAMES OAKES and CO.,
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WENLOCK IRON WHARF, 20, WHARF ROAD, CITY ROAD, LONDON,
Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including best cold-blast Iron Retorts, Socket and Flange Pipes of all sizes, Bends, Branches, Syphons, Lamp Columns of various patterns, &c.
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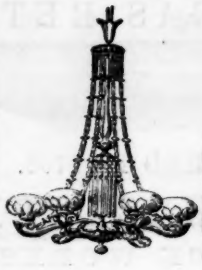

F. & C. OSLER,
45, OXFORD STREET, LONDON;
Manufactory—Broad Street, Birmingham—Established 1807,
MANUFACTURERS OF GLASS CHANDELIERS, GLASS LUSTRES, TABLE GLASS, &c. &c.
ELEGANT CRYSTAL GLASS CHANDELIERS, for GAS, from £4 upwards (Made from "REGISTERED" DESIGNS), with GLASS BRANCHES, &c.; suitable for DRAWING-ROOMS and BALL-ROOMS. The more extensive use of GAS in private dwellings has induced Messrs. OSLER to direct their particular attention to the manufacture of this class of articles—which, with a view to their general adoption, are offered at very moderate prices. Purchasers can select from a great variety of patterns, to which additions are being constantly made.
THEATRES, CONCERT, ASSEMBLY, AND BALL ROOMS LIGHTED BY ESTIMATE ON THE LOWEST TERMS.

SALE OF GAS ACT.

MESSRS. CROLL, RAIT, AND CO.,

Manufacturers of Croll's Patent Improved

DRY GAS-METER,

being informed that several Gas Companies are under the impression that Dry Meters will not be allowed by the above Act, beg to say that such is not the case, inasmuch as the Act embraces "every kind of machine used for measuring gas," and provides for the testing of the same, in its 13th clause.

Speaking for themselves, and of the Meters manufactured by them, C., R., and Co. have the gratification of knowing that not one single Meter out of the large number they have sold, will, when tested by an Inspector, be rejected; and, consequently, that neither Gas Companies nor Consumers who have these Meters in use will be put to one farthing expense for alterations.

C., R., and Co. always adopted the unit of measure provided for by the 2nd clause of the Act, and have never allowed themselves a greater latitude than 1 per cent. either fast or slow, and they intend to adhere to these limits, notwithstanding that the Act allows 2 per cent. fast and 3 per cent. slow.

C., R., and Co.'s Meters register most correctly all the gas passed through them, whether it be the smallest quantity or the full complement for which the Meters are made; and *they are prepared to give written guarantees to Purchasers that the Meters shall, when tested by an Inspector on his appointment under the Act, be approved of by him as correct. In the event of such not being the case, the Purchaser to be entitled to return the Meters to C., R., and Co., and claim from them their cost, together with any expenses incurred by their rejection.*

Further, C., R., and Co. undertake, during a period of five years from the date of purchase, to put into good order, free of charge to the Purchaser, any Meters of their manufacture which may become defective.

CROLL, RAIT, AND CO.,
DRY GAS-METER MANUFACTURERS,
CANAL BRIDGE, KINGSLAND ROAD, N.E.,
are prepared to supply
STANDARD CUBIC FOOT MEASURES,
of the Capacity required by the 2nd Clause of the Act,
as well as Gasholders correctly graduated thereby.
STATION-METERS, GOVERNORS, PRESSURE-REGISTERS, AND OTHER GAS APPARATUS SUPPLIED.
Particulars given upon application.

D. HULETT and CO., 55 and 56, HIGH HOLBORN, LONDON,
PATENTEES and MANUFACTURERS of the ONLY GOOD MERCURIAL GAS REGULATOR,
invite the attention of Gas Companies and the Trade generally to their Improved GAS-METERS, which they warrant equal to any in Quality, Workmanship, and Simplicity of Construction, and the only Meters from which Gas cannot be obtained without being duly registered.
MANUFACTURERS OF
GAS CHANDELIERS, GLASS LUSTRES, HALL LANTERNS, VESTIBULES, BRACKETS, PENDANTS;
DOUBLE CONE, ALBERT, SHADOWLESS, & EVERY DESCRIPTION OF BURNER, UNION JETS, BATSWINGS, ETC.;
IMPROVED FULL-WAY CARTER'S VALVES (much approved of);
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